

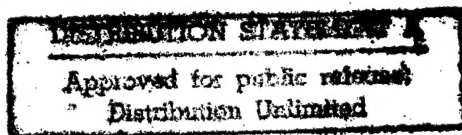
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24 January 1984

# East Europe Report

SCIENCE AND TECHNOLOGY



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24 January 1985

# EAST EUROPE REPORT

## SCIENCE AND TECHNOLOGY

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POLISH-SOVIET TECHNOLOGICAL COOPERATION OUTLINED

Soviet Technical Centers in Poland

Warsaw ZYCIE WARSZAWY in Polish 1 Nov 84 p 1

[Article: "Stankoimport, Autoexport, Traktorexport; a Network of Soviet Technical Facilities in Poland; Shortly, a New Center in Karczew"]

[Text] An increasing variety of equipment, starting with machine tools and tractors and ending with calculators and computer systems, is the object of mutual exchange between Poland and the USSR.

These technical centers are helping to improve the servicing of those machines and equipment delivered in the framework of mutual commercial trade. Polish enterprises will establish their own technical centers in the USSR, and Soviet commercial enterprises will establish their technical centers in our country.

These matters are regulated by international agreements. At the request of our Soviet partners, the CHZB [Budimex Foreign Trade Enterprise] signed a contract to construct several facilities that will be the technical centers and will supervise technical services. Two such facilities arose in Warsaw during the 1978-1982 period: the Stankoimport Center for Machine and Machine Tool Technology and the Autoexport Center for Automotive Technology.

Wladyslaw Juraszynski, Budimex's commercial director, told us that the last of the three centers called for in the mentioned international agreement, namely, the Traktoexport Technical Center in Karczew, is now being completed. The contract concerning this matter between the CHZB and the Soviet Sovtrim Enterprise was concluded in March 1980, and work was initiated in Karczew in July of that same year.

The present advanced state of construction guarantees that the facility will be finished and put into operation before the contracted date, that is, February 1985. Some of the accommodations will be transferred to the future users on the 67th anniversary of the Great October Socialist Revolution. The Karczew facility, which will have a volume in excess of 61,000 cubic meters, is being built as a turnkey facility, just as the previous facilities. The engineering documentation was developed by Poland's Torporjekt and Budopol Design Offices. Many enterprises participated in building this



facility, including Exbud Kielce (the general contractor) and Kielce's Budopol (the general coordinator). It is not possible to name all the other specialized units but, as can be seen from those already mentioned, contributions were made by personnel from various units.

As a trading partner of the Soviet Sovtrim Enterprise and other enterprises, Budimex built numerous other facilities in Poland on their orders. Worthy of mention is the USSR Economic and Trade Council Office Building in our country. This building earned the title "Master of Warsaw" in a contest organized by our editorial staff. Presently, a number of other buildings are under construction which, like the previous ones, will be a good calling card for our contracting capabilities. Somehow, it also would be nice if this exported quality could be obtained for Polish customers as well.

#### Coordination of Technological Processes

Warsaw TRYBUNA LUDU in Polish 6 Nov 84 pp 1, 4

[Article: "Electronics, Automation and Robots in Polish Industry; From the Deliberations of the Presidium of the Government"]

[Text] The development of electronics is increasingly affecting technological progress, and economic and social organizations.

Improving industrial efficiency also requires greater implementation of automation and robotization of technological processes. The significance of these problems was especially emphasized during the deliberations of the 16th Plenum of the PZPR Central Committee. The need to develop these branches in all the socialist countries was discussed during the 38th Extraordinary CEMA Session, and important decisions were made in this area.

The problems concerning the electronization of the national economy by 1990, and the automation and robotization of industrial production, were the theme of a meeting of the Presidium of the Government at the Cemat CNPME [Scientific Production Center for Electronics Material] under the chairmanship of Premier and General of the Army Wojciech Jaruzelski.

Marian Wozniak, first secretary of the PZPR Executive Committee and Politburo member, participated in the deliberations. Invited guests and representatives of economic units, associations, scientific research institutions and scientific-technical associations also participated. The following associations were represented: Unitra [Electronics and Telecommunications Industry Association], Mera [Automation and Measuring Apparatus Industry Association], Telkom, PAN [Polish Academy of Sciences], Warsaw Polytechnic, Wroclaw Polytechnic, and the Association of Polish Electrical Engineers. The following institutions were represented: the Institute of Electronics and Precision Mechanics Technology, WAT [Military Technical Academy], the Sejm Socioeconomic Council and the Sejm Commission on Industry.

The report, as related by PAP is as follows.

At the start of the visit to the CNPME, Premier W. Jaruzelski and some members of the Presidium of the Government visited the center's Silicon

Crystallization Department. Mieczyslaw Fracki, the center's chief director, apprised the visitors of the modern technology to obtain one of the basic materials for electronics.

Then the guests visited the exhibit "Electronics, the Medium for Progress and Modernity," which illustrates the accomplishments of our electronics industry.

Electronics can be a source of great savings. The premier said that as many as 60 percent of Poland's electric motors operate continuously without loads. Temporarily disconnecting the unloaded motors would decrease their power consumption by 30 percent.

Many new products developed by Polish design offices were presented at the exhibit. Among other things, there were the production line fault recorder for Katowice's Meraster production line that won the Brno International Fair Gold Medal; the computer systems based on cooperation with the Soviet Union; monitoring equipment for technological processes; fiber-optic based optoelectronic systems; and electromedical technology equipment. At the exhibit the visitors became acquainted with several new medical devices developed by our industry, including an electrocoagulator to perform bloodless operations, reanimation systems, breathing aids, apparatus to stimulate paralyzed muscles, and an artificial kidney produced by the Famal Medical Apparatus Factory in Lodz.

After visiting the exhibit, W. Jaruzelski met with representatives of the center's management, party organization and self-government. The enterprise's current activities and problems were discussed.

In the afternoon, the deliberations of the Presidium of the Government began at the CNPME.

At the opening, Janusz Maciejewicz, the minister of metallurgy and engineering industry, informed those present of the status of electronics production in Poland and about the program to electronize the economy. Electronization is facilitating significant progress in industry, transportation and communications; it also is decreasing energy consumption in these areas by 15 to 20 percent. Vehicles equipped with electronic controls burn 20 to 25 percent less fuel. As a result of this continuing electronization, the entire economy can become less materials-intensive.

Since the program was implemented 1 year ago, over 200 billion zlotys of electronics products have been manufactured, of which about 25 percent is exported. Thus, electronics occupies one of the main positions in export volume among all the branches.

The production of highly integrated circuits is still insufficient and is the greatest barrier in realizing the electronization program. We produce 1.5 million of these circuits annually, but we now need 4 million and the need is increasing. Thus, it is necessary to expand the production base, which will determine the level of commercial and consumer products.

We have taken a big step forward in information science, especially in producing and supplementing microprocessor equipment based on cooperation with the USSR. This has opened up the Soviet market for us, enabled large-scale production and, at the same time, satisfies domestic needs.

One of the important benefits resulting from electronization is increased labor productivity, the result of automating and robotization of technological processes. This is borne out by the experiences of the FSO [automobile factory] and the Stalowa Wola Steel Mill, where robots were initially installed on an experimental basis and then became an indispensable part of many production processes. However, many barriers to robotization still remain. In recent years, 600 robots have been produced in Poland, but only 370 are fully employed. According to the program's projections, several thousand robots will be available in Poland by 1990.

The representatives of the electronics industry and their associations, and the research and development facilities of this branch of industry and of other scientific institutions, including PAN institutions, were most vocal during the discussions.

In characterizing the electronics industry's current potential, Dariusz Lochocki, Unitra's director, said that the production of end products and components this year will amount to 215.6 billion zlotys, including 561 million rubles exported to payments area I and 62 million dollars to payments area II. Despite its pressing difficulties, the electronics industry--which consists of 77 enterprises, 49 production plants, and 12 scientific research facilities, and employs almost 150,000 people--is utilizing its production potential with increasing effectiveness. The gap between us and the Western countries and the other socialist countries is most obvious in the electronics material base, with the worst shortages occurring in semiconductors and large-scale integrated circuits, including microprocessors. The electronics industry is not able to finance its own development. Therefore, the state must subsidize its development just as is done in other countries. These matters were taken into account in Council of Ministers Resolution No 77 of June 1983, which in practice has been difficult to implement because of the lack of complementary activity among all the cells that were called upon to implement this resolution.

Cezary Ambroziak, director of the Institute of Electronic Technology, discussed world trends in electronics. He emphasized that developing an electronics industry, especially the production of materials and components, is very capital-intensive. However, expenses incurred for this goal are returned with interest. The visible trends are: integration of electronics firms; increased share of profits allocated for expansion purposes; and greater support by individual governments for this development. This also is obvious in the socialist countries. Prof Bohdan Paszkowski of Warsaw Polytechnic, chairman of the PAN Committee on Electronics, emphasized that the development of microelectronics is one of the basic conditions for restructuring our economy, and thus greater attention must be focused on industries employing most of our scientific-technical brainpower. The electronics industry's research and development facilities have talented

cadres. The electronics industry did not waste any licenses; most licenses were independently developed and improved.

However, the electronics industry is not receiving enough help from other industries, for example, the metallurgy and chemical industries. Making the electronics industry independent in this area would solve the problem. The speaker also said that it is necessary to subsidize the production of electronics material and to take steps to improve the professional status of designers of electronics products.

Prof Jerzy Buc, director of the Institute of Precision Mechanics, discussed robotization. He said that the proper conditions exist in Poland for producing industrial robots, especially those robots our industry needs most at its present level of technology.

During the discussions, many applications of electronics and its products in various branches and sectors of the economy and its resulting benefits were presented.

Mieczyslaw Fracki, the chief director of the CNPME, emphasized the role played by the material base, especially the chemical industry, in the development of electronics and in the electronization of the economy. He said that that auxiliary industries do not always consider the needs of the electronics industry.

Wladyslaw Baka, the government's plenipotentiary for economic reform, stated that the problem of electronics development hinges on the question of restructuring industry and should be treated as a realistic alternative to developing the power industry and the fuel complex. However, future benefits must be assured, and we should not eliminate the possibility of developing profitable export. The electronics industry's organizational and systemic solutions should aim at mobilizing the resources of the enterprises manufacturing electronic equipment and materials as well as mobilizing the users. The reform encourages this type of solution.

Stanislaw Nieckarz, the minister of finance, emphasized that the enterprises must intensify their activities significantly. He said that when all is said and done, the realization of the program must have a positive effect on the country's balance of payments.

The enterprises must take greater advantage of the possibility of obtaining foreign exchange credits from Bank Handlowy, which also means that the credits must be repaid with interest. One should not rely solely on the central allocation of foreign exchange. The same can be said about zloty financing. Since many independent enterprises cannot afford the resources for expansion in their own area, they should combine efforts for this purpose and enter into appropriate organizational systems.

Deputy Premier Zbigniew Szalajda stated that the developed program is not a compromise, as stated during the discussions, between the aspirations of scientists and electronics engineers and the economy's capabilities. After

the state's financial possibilities are considered, as many resources will be allocated for developing electronization as our industry can rationally use.

The speaker mentioned the reasons why industrial robots are not being requested by the enterprises. Above all, the offered robots were not sufficiently reliable and technically advanced; it takes a long time to get them operating, and it is very costly; and the level of production organization in the enterprises often is still unsatisfactory. The program is creating good conditions for the development of the electronics branch as well as for automating and robotizing production in our country. But care must be taken that the program be realized consistently and precisely.

In concluding the deliberations, Premier Jaruzelski emphasized that the meeting met expectations. The resolutions of the Presidium of the Government and the suggestions and recommendations presented during the discussions are part of the deliberations' accomplishments.

There is no need to reemphasize the role and importance of electronics, since this was discussed by the most eminent specialists in this field in the country. The concern and creative fervor of the cadres working in this area guarantee that the resources that we will be able to allocate for the development of electronics, automation and robotization will be properly used. At the same time, there is a need to create conditions such that it would be profitable for a plant to implement robotization and automation or, what is more important, that it would be unprofitable not to use these tools of technological progress.

The premier stated that our cadre potential, our highly qualified specialists, forms the basis of our wealth. Much is expected of these cadres. We must improve constantly the material and laboratory conditions for these cadres.

It was properly emphasized that we need our own kind of socioeconomic agreement in the field of technological progress. It is in the area of the country's primary needs, current as well as future. Therefore, we must propagate more extensively the notable achievements of Poland's scientists, engineers and technicians. An understanding of technology must be instilled in the socioeducation process, especially in the realm of electronics, whose development to a great extent will determine what our country will be like in the future. The socialist countries have accomplished much in this area, and we should profit from these experiences, expanding collaboration and cooperation.

W. Jaruzelski emphasized that the significant links between science and industry achieved in the sphere of electronics is especially valuable. He said that the center in which the deliberations are being held is the best example of this. Similar solutions should be applied to other areas and branches.

Premier Jaruzelski paid tribute to and thanked the representatives of science and industry who were invited to the meeting and, through them, all the workers employed in the field of electronics for their achievements to date.

He also wished them success in the future in their efforts to develop the electronics industry to meet the needs of the entire national economy and of the entire country.

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The Government Press Office has reported that on 5 November the Presidium of the Government passed the following resolution on the electronization of the national economy.

It has been resolved to give economic preference, in accordance with the principles of the economic reform, to organizational units and enterprises that are implementing the electronization program. At the same time, the minister of metallurgy and engineering industry and the plenipotentiary of the government for economic reform are instructed to present institutional solutions for developing electronization, which also should encompass a draft for coordinating the activities of the numerous enterprises and organizational units involved in electronics that are still too dispersed.

Tasks in the area of developing science and technology, production and investments that are very important for the electronization of the national economy will be commissioned by the government. The CNPME and the Tewa Electronics Factory in Warsaw, and the Kazel Electronics Industry Plants in Koszalin, will be expanded.

In 1985 the Ministry of Science, Higher Education and Technology will allocate over 5 billion zlotys to finance research and development work in the electronics and telecommunications industries.

By 1 September 1985 the ministers and directors of central offices supervising higher and secondary schools will develop a program for universal education in the area of information science and a program to implement and apply computer technology in educational processes for the 1986-1990 period.

It has been resolved that the program implemented to electronize the national economy by 1990 will be included in the National Socioeconomic Plan for the 1986-1990 period.

The Presidium of the Government also adopted a resolution regarding work associated with preparing and implementing the automation and robotization of industrial production. The "Directed Program to Expand the Robotization of Production up to 1990" and the work schedule in this area was approved.

The Presidium of the Government created the Coordinating Group on Automation and Robotization, which will monitor the execution of the tasks designated in the program. The ministers and directors of the economic ministries are obligated to implement this group's recommendations in the supervised workplaces.



## Coordination of Plans

Warsaw RZECZPOSPOLITA in Polish 27 Nov 84 p 3

[Article by Jadwiga Korzeniowska: "Coordination of Plans Between the USSR and Poland"]

[Text] Scientific-technological cooperation with our most important partner and ally, the Soviet Union, is taking on dimensions that are increasingly more extensive and multilateral. Thus, it can be expected that we will overcome much faster the impasse in which we still find ourselves, with obvious benefits for both sides.

The stage for jointly developing the assumptions of the 5-year plans for scientific-technological development, the primary directions for developing science and technology up to the year 2000, is now behind us. A list of the most important scientific and technological problems that have to be solved by 1990 has also been defined precisely. Participating in these goals will be 118 Polish research and development institutions and 138 Soviet institutions. Thus, the bilateral involvement of immense scientific potential, personnel, and resources is projected.

Exactly 153 problems that are of basic significance to our country's science and economy have been included in the plan of tasks to implement the "Long-Term Program To Expand Economic and Scientific-Technological Cooperation Between the USSR and Poland up to the Year 2000." This program was adopted at the 27th Session of the International Soviet-Polish Commission for Economic and Scientific-Technological Cooperation.

As indicated by the list, both sides will jointly realize the tasks to expand and modernize existing production enterprises by implementing the best technological ideas. The construction of new, modern industrial facilities is also projected. This will require the development of new technological solutions in the fields of design, technology, work organization, management and research methods. These aspects were widely considered in the plan of tasks for economic and scientific-technological development.

Of the decisions that were made, 33 problems will relate to the implementation of modern technological processes to improve the production of machines and equipment and to decrease the consumption of raw materials. Five of the scientific-technological problems that will be solved jointly are intended to make us much less dependent economically and technologically on the highly developed capitalist countries. Improving the quality and technological level of products will be the subject of 14 problems; conservation of material resources, 24 problems; and establishing the most important, qualitatively new directions for developing the economy, 10 problems.

As can be seen from the abbreviated list, these are tremendous tasks requiring large outlays of resources and personnel, but within the capabilities of the combined resources of both countries, on which the sense of our economic and scientific-technological cooperation with the Soviet Union depends.

The planned goals will require the complete mobilization of the research and development base. This will be assured by, among other things, combining the tasks of the "Long-Term Program To Expand Economic and Scientific-Technological Cooperation Between Poland and the USSR up to the Year 2000" with the government's plans to develop science and technology during the 1986-1990 period and in future years. At the same time, the financial resources will be established, without which it would be difficult to initiate the projected scientific-technological work. Technological resources and organizational activities synchronizing joint activities will also be determined in detail.

The resolution of the problems outlined in the plan of tasks, especially the results of cooperation that reflect the application of scientific-technological development to production, will be monitored by the organs of science and technology of both countries.

Consultations on the plans to develop science and technology between Poland and the Soviet Union are supposed to be completed in the first half of 1985, and the comprehensive plan for scientific-technological cooperation for the 1986-1990 period, which will be presented for approval by the International Soviet-Polish Commission for Economic and Scientific-Technological Cooperation, will achieve its final form in the second half of 1985.

It is projected that most of the tasks will be realized on the basis of detailed contracts, agreements and meetings, which will affect the scheduling and specific execution of the tasks. Such arrangements of cooperation undoubtedly will accelerate scientific-technological progress, especially in those areas in which Poland is way behind.

In such a system, the "dark clouds" that the restrictions of the United States were supposed to bring about will only remain a symbol of political manipulation by our political opponents that in the end were undoubtedly very cunning in the scheme to create chaos. In fact, we are feeling as of now the effects of the applied economic and scientific-technological blockade, but fortunately it is a temporary situation. Our political, economic and scientific-technological alliances with the Soviet Union not only guarantee Poland's survival, but they also will promote development and rescue Poland from its current difficulties.

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SELECTIONS ON CSSR COMPUTER TECHNOLOGY

CSSR IGS Systems

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 3, 1984  
pp 314-318

[Article by Eng Jaroslav Toifl, Research Institute for Mathematical Machines,  
Prague: "Czechoslovak JSEP and IGS 2 Graphic Systems"]

[Text] The disproportion between the time required for performing a calculation on a computer and the time needed for the preparation of data and/or its assessment is increasingly coming to the fore in computer technology. Another persisting problem is the possibility of an operator's interference in the progress of a calculation so as to arrive at a result corresponding to his concepts and requirements. These requirements become manifested particularly when the computer deals with a task whose input and output is in graphic form. This form best reflects human imagination, even though it is utterly unsuitable for a digital computer. For that reason there is an ongoing world-wide development of techniques which would make possible the rapid conversion of data from graphic form to digital for input into the computer and from digital into graphic form on the computer's output. With requirements for interaction, it becomes necessary to perform both conversions even during the calculation to afford to the operator visual access to the data being processed so that he can intervene in accordance with his ideas. Systems which permit the implementation of such functions are called interactive graphic systems (IGS), and facilitate effective cooperation between man and machine. They represent a general tool which can be used through the generation of suitable applicational software in variously specialized CAD and/or CAM systems, and in so doing significantly increase the productivity of designers and developmental specialists in these branches. They form the prerequisite for the greatly desired decrease in time needed for the development of a new product. The time savings will become reflected primarily in innovations of an existing product whose data are stored in a data bank and where all that is involved is merely making changes in existing documentation.

Problems pertaining to graphic systems have been a subject of interest in the CSSR for quite some time. In the 1960's came the development of the first Czechoslovak drafting system at the VUMS k.u.o. [Research Institute for Mathematical Machines, fiduciary concern organization] in Prague, which founded a whole series

of subsequent types bearing the designation "digigraf" derived from the first system. It was exported to socialist countries; from it was developed the EC 7054 drafting system, which underwent international tests within JSEP [uniform system of electronic computers] in 1972. It was an independent drafting system that could be connected to a JSEP multiplex channel, and could operate in off-line mode and control from a perforated tape. The next developmental stage coincided with the 3.5 generation of JSEP computers in the form of the three graphic complexes EC 7907, EC 7941 and EC 7942.

The EC 7907 consists of a digigraf-type drafting system and a digitizer with a free carrier. Both of these units can be independently connected to a JSEP multiplex channel and can be operated in off-line mode. This complex was subjected to international JSEP tests in 1979. A year later came the testing of the EC 7941 and EC 7942 complexes, the common characteristic of which is that they form an autonomous unit that contains a 16-bit minicomputer with its systemic peripheries, a digitizer with a free carrier and a drafting system. In the case of the EC 7942, the drafting system can be provided with heads which will facilitate technological functions in connection with graphic display. The system was later complemented by the ODI color raster display, which facilitated interaction in the simplest form. This display originated in cooperation with VUAP [Research Institute for Automation Systems] k.u.o. and VUMS k.u.o. and is manufactured by the ZPA [Plants of Industrial Automation] in Cakovice. All of the graphic systems listed above are manufactured by ZPA Novy Bor.

In keeping with the program for continued development of JSEP, the CSSR is currently charged with the development and production of the EC 7943 system for processing graphic information. The system is intended to generate, process and present graphic information and must be capable of processing graphic functions in accordance with the international GKS norm, both independently for tasks of a limited extent and as an intelligent periphery of a large JSEP computer system. The system consists of several parts that can be deleted from its complete configuration or multiplied, depending on the customer's requirements. These parts have an independent EC cipher. They communicate mutually or with a hierarchically higher computer via a common control unit constituted by a built-in 16-bit minicomputer. This complex is to be further equipped with a device for automatic graphic information reading.

From the above it follows that the developed systems were of increasing complexity. The EC 7054 system provided merely for the output of graphic information from a JSEP computer, the EC 7907 complex provided for semiautomatic input and output of graphic information by a JSEP computer, the EC 7941 and 7942 complexes provided for semiautomatic input, output and partial processing of information at the level of the built-in minicomputer with later complementing that provided for simple interaction by connection of a color raster graphic display. In addition to semiautomatic input, output and processing of graphic information at the level of a built-in minicomputer, the EC 7943 complex that is undergoing development will permit the interactive processing of information, and will also allow for the utilization of access to the data base of a hierarchically higher computer and facilitate automatic reading of graphic information and its later interactive processing.

In view of the fact that interactive graphic systems are worldwide an object of increased interest and lately of intensified embargo, the minister of FMEP [Federal Ministry of Energy and Fuels] issued "Measure No 37/1983 for the development and production of Czechoslovak interactive graphic systems of the second generation" and the general director of ZAVT [Plants for Automation and Computer Technology] a follow-up "Instruction No 7/1984" dealing with the same problems. Both of these documents pursue the goal of enormously accelerating CSSR efforts in this area so that usable systems can be developed, produced and applied in CSSR industry as early as 1985. The attainment of this objective calls for making maximum use of all studies and efforts already carried out within JSEP and/or SMEP [system of small electronic computers] and, furthermore, developing a whole series of additional systems.

The IGS 2 system is of modular design and makes it possible to devise a selected configuration from its individual components. It is designed at two levels, I and II, of which the second level will be implemented in two variants, II A and II B. The individual components of the IGS 2 system that are divided into these levels are:

- a 16-bit minicomputer for level I functioning as a control unit with a minimum 128 KB working memory storage and an adapter for connection to a level II computer;

- a 16-bit minicomputer for level II A functioning as a hierarchically higher computer with a minimum of 1 MB working memory storage and common systemic peripheral devices;

- a 32-bit SMEP minicomputer for level II B functioning as a hierarchically higher computer with a minimum 4 MB working memory storage;

- a 32-bit medium JSEP computer for level II B functioning as a hierarchically higher computer with a minimum 4 MB working memory storage;

- a color raster graphic display with resolution of 288 x 380 points, 515 x 512 points, and, if development succeeds, 1024 x 1024 points;

- a black-and-white vector display with 1024 x 1024 points that can simultaneously image 120 m of vectors on the display screen;

- an alphanumeric display, e.g., CM 7202;

- a drafting system of the digigraf type in format A0 or 2 A0;

- a format A 1 cylindrical drafting system;

- a format A 2 planar multicolor drafting system;

- a digitizer with free carrier, format A 1 or A0;

- a format A3 display board for graphic interaction in level I;

- an electrostatic printer with graphic display;
- electromechanical mosaic printer, e.g., modified Consul 2111;
- an external cassette disk memory, e.g., Consul 721 or 723;
- external disk memories of 29 MB or 100 MB;
- an alphanumeric keyboard;
- a functional keyboard;
- accessories for connection in series with a hierarchically higher computer.

Level I is called "interactive graphic station" and is the operator's workplace. Its structure is shown in Figure 1. Its block structure indicates that all the means required for interaction and data processing are built into the station. This station can be set up either in a configuration with a color raster graphic display of selected resolution power, or in a version with a black-and-white vector display. The choice depends on the customer.

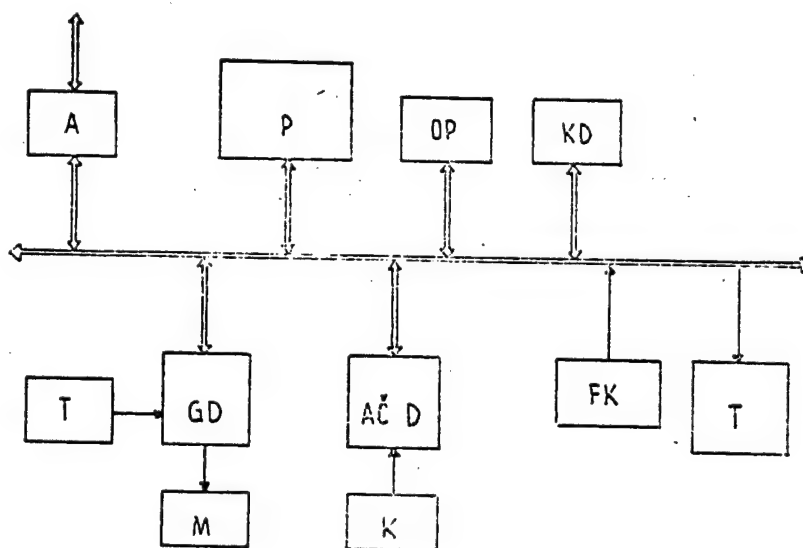


Figure 1. Structure of level I IGS

Key: P - 16-bit processor	ACD - Alphanumeric display
OP - 128 KB working memory storage	K - Keyboard
M - Color TV monitor	FK - Functional keyboard
T - Display board	T - Series dot printer w/graphic modem
KD - Cassette disk	A - Adapter for in-series connection to a hierarchically higher computer
GD - Graphic display	

Levels II A and II B have an identical block structure and differ only in the selected hierarchically higher computer. Level II A calls for a 16-bit SMEP type processor or ADT (Figure 2), level II B for a 32-bit SMEP or JSEP processor. Figure 3 shows an overall view of the graphic station, i.e., level I IGS 2 in the version using a raster graphic display.

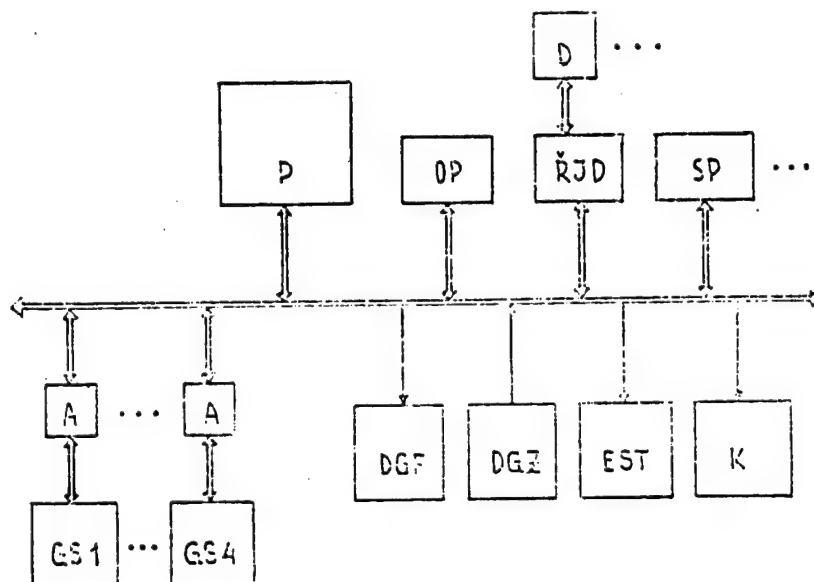


Figure 2. Structure of level II IGS

Key: P - 16-bit SMEP processor or ADT    DGF - Digigraf  
 OP - 1 MB working memory storage    DGZ - Digitizer with free carrier  
 RJD - Disk control unit    EST - Electrostatic printer with graphic modem  
 D - Disks 28 MB or 100 MB  
 SP - Other systemic peripherals    K - Drafting system A2 or A1  
 GS - Graphic station    A - Adapter for in-series connection

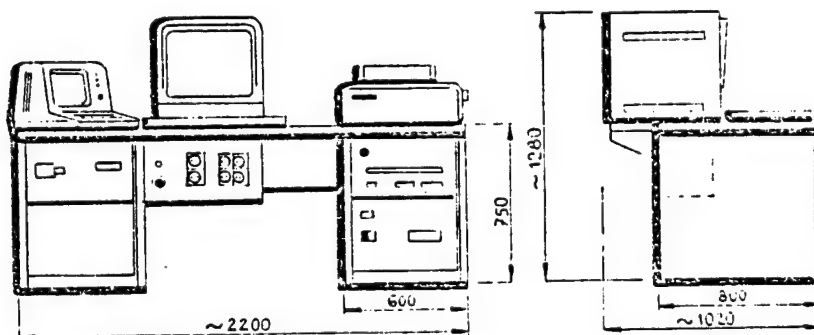


Figure 3. Overall view of graphic station

Setting up the IGS 2 system into two levels will also be supported by basic software, i.e., operation of the interactive station will be provided in the operating systems of hierarchically higher computers and analogous software will

be provided at station level. Software development will respect the proposed GKS norm. Level II systems will have a data base system corresponding to the selected processor.

#### New SMEP Computers

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 3, 1984 pp 319-325

[Article by Eng Ivan Sevcik, Computer Technology Research Institute, Zilina, and Eng Vaclav Vojtech, Office Machines, Prague: "New SMEP Computers With Common Busbar"]

[Text] The outline of SMEP hardware operating on the principle of a common busbar, published in No 1/84 of this publication, lists individual computers of this series.

This contribution offers more detailed information about the innovated variants of those computers. They are specifically:

- SM 52/11.M1 (M16-23),
- SM 50/50.M1 (M16-22),
- SM 52/12 (M32-1).

#### SM 52/11.M1 Minicomputer

The SM 52/11.M1 system, also bearing the operational designation SM 52/11 PLUS, is a continuation of the currently produced SM 52/11 system and in ascending direction it is compatible with SMEP systems using a common busbar.

The SM 51/11.M1 system differs from the SM 52/11 system primarily in:

1. The capacity of its connectable working memory storage from 0.25 MB to 4 MB, whereby with the use of memory elements MHB 4116 (16k x 1) it is possible to build in a 1.25 MB capacity semiconductor working memory storage with self-correction (1 control plate and 5 memory field plates). With the use of memory elements 64x1 it will be possible in the future to devise a 4 MB capacity (1 control plate and 4 memory field plates).
2. The addition of a decadic processor (CIS) for support of COBOL translator.
3. Improved structural design making better use of space in racks, simpler cabling in the power feed part as well as better cooling and easier handling.

These changes called for modifications and complementing of the processor, new design of memory, systemic units, power supply system and mechanical parts.

--The potential for using enlarged memory storage was verified by the COS RV, DIAMS and DOS KP (DOS RVR) operating systems during international tests in December of 1983.

The SM 52/11.M1 minicomputer is a budgeted computer and its deliveries will commence in 1985. Production of the SM 52/11 computer will consequently be discontinued sometime in 1987.

#### SM 50/50.M1 Minicomputer

This system, also bearing the operational designation SM 50/50 PLUS, is a continuation of the SM 50/50 system and expands its potential.

The SM 50/50.M1 system is in ascending direction compatible with SMEP systems using a common busbar.

As in the SM 50/50 system, the basic structural element of its processor is the K 1804 (AM 2900) microprocessor series from the USSR.

In comparison to the SM 50/50, the SM 50/50.M1 system has been supplemented primarily by the following new functions:

1. User microprogramming (total addressing space of control memory is 4 K).
2. Potential for supplementing the processor with a floating decimal point.
3. Potential for increasing the working memory storage capacity to 2 MB, with design envisioning a working memory storage capacity of up to 0.5 MB with the use of MHB 4116 (16 K x 1) memory elements and up to 2 MB with the use of 64 K x 1 memory elements.
4. Offering selection among NMOS, CMOS and EPROM memories.
5. Structural design for application in industrial environment and in robotics as well as design of some special modules for these applications.

Production of the budgeted SM 50/50.M1 computer will start in 1986. In this connection the production of a frame-type version of the SM 50/50 microcomputer is planned for 1985-87.

Termination of the production of the frame version of the SM 50/50 computer in 1987 and its gradual replacement by the SM 50/50.M1 computer does not affect the continuation of production of the SM 50/50 terminal station.

#### Continued Development of 16-Bit Systems

With the availability of higher integration, circuits of custom and semicustom design in the next stage, continued development of 16-bit SMEP microcomputer systems using a common busbar is expected to continue. The key structural elements of the future are considered to be the K 1801 microprocessor series from the USSR and semicustom design circuits from the CSSR.

#### SM 52/12 System

In keeping with worldwide trends it can be envisioned that in the future some special applications will call even in our country for using a computer that offers an actual address space larger than the 64 KB offered by 16-bit computers.

The 32-bit SM 52/12 minicomputer is an expansion of the 16-bit computer series, whereby selection of a new layout is based on the following rules:

a) maintaining maximum compatibility with these 16-bit minicomputers. By maintaining maximum compatibility we mean:

- maintaining data formats,
- maintaining input/output systems' media formats which in connection with the maintenance of data formats means that all data sets can be processed on both 16-bit and 32-bit computers,
- maintaining maximum congruence in the syntax of Assembler,
- potential for running user programs from 16-bit SMEP systems;

b) providing for easy expandability of the new layout, i.e., providing a layout that is not closed from the viewpoint of introduction of new instructions and types of data;

c) devising of means oriented toward easier implementation of higher languages.

#### Technical specifications

##### Sets of instructions:

- original set of instructions (248 basic instructions),
- basic set of instructions of 16-bit SMEP systems.

Methods of addressing and general registers: the SM 52/12 provides 16 32-bit registers in its processor for programmers in the Assembler language. In comparison to 16-bit SMEP systems, the methods of addressing have been expanded by the so-called direct addressing and index addressing.

Control method: the SM 52/12 processor and some input/output adapters are controlled by a microprocessor. The following data are characteristic of the microprogram equipment of the SM 52/12 processor:

- control word width--96 bits + 3 parity bits,
- control memory address space--8 K x 96 bits,
- microprogram ROM--4 K x 96 bits,
- microprogram RAM--1K x 96 bits,
- machine cycle--200 ns.

Addressable extent of memory and access to memory: a 32-bit word in the SM 52/12 processor makes it possible to address 4 GB of virtual address space. Access into memory is controlled by the memory organizer.

Maximum capacity of physical working memory storage: 8 MB or 32 MB.



Capacity of CACHE memory: 8 KB.

Time for access to memory with the use of CACHE: 290 ns.

The SM 52/12 processor is also characterized by great parallelism in performance of individual operations manifested by:

--implementation by buffer memory for a chain of instructions (making full use of the opportunity to prepare subsequent instruction while the preceding instruction is being performed);

--implementation of the CPU data part in the form of four sections working in parallel:

- arithmetic,
- exponential,
- data shifts,
- addressing.

Commencement of production of the SM 52/12 computer is readied for 1988.

In conclusion are offered two tables. The first offers more detailed basic data for the described SM 52/11.M., SM 50/50.M. and SM 52/12 systems together with the SM 52/11, while pointing out the difficulty encountered in comparing 16-bit and 32-bit systems with a view to the differing criteria for their assessment.

The second table offers a very brief comparison of all systems working on the principle of a common busbar.

Table 1. Comparison of basic attributes of the described SMEP computers

#	Feature	Unit	SM 50/50.M1	SM 52/11	SM 52/11.M1	SM 52/12
1.	Processor size	3/3 plate	2-4x2/3	6-11x3/3	8-13x3/3	21x4/3
	Basic module size	SMEP	5-15x2/3	20-27x3/3	25-35x3/3	50-90 (2/3+4/3)
2.	Word length	bits	16	16	16	32
	Number of address modes	12	12	12	24	
3.	Systemic busbar capacity	MB/s	3	3	3	48
4.	Data types					
	Fixed decimal point					
	byte (8 bits)		yes	yes	yes	yes
	word (16 bits)		yes		yes	yes
	double word (32 bits)		no	no	no	yes
	quadruple word (64 bits)		no	no	no	yes
	Floating decimal point					
	simple accuracy (32 bits)		yes	yes	yes	yes
	double accuracy (64 bits)		yes	yes	yes	yes
	Condensed decadic chain					
	0 to 16 byte (31 numbers)		no	no	yes	yes
	Symbol chain					
	0-64 KB (1 symbol = 1 byte)		no	no	yes	yes
	Variable length bit field					
	0 to 32 bits		no	no	no	yes
	Numeric chain					
	0 to 31 bits (numbers)		no	no	yes	yes
	Line of 0 to 2 billion items		no	no	no	yes
5.	Set of instructions	basic	yes	yes	yes	yes
		expanded	yes	yes	yes	yes
		floating point	yes	yes	yes	yes
		double accuracy	yes	yes	yes	yes
		diagnostic	no	yes	yes	yes
		user	yes	yes	yes	yes
		commercial	no	no	yes	yes
		Special instructions				
		PUSHR				
		POPR	no	no	no	yes
		operation with				
		group of registers				
		NOVA				
		PUSH	no	no	no	yes
		address computation				
		of processed quantity				
		Instruction for				
		oper. with lines	no	no	no	yes
		Instruction for				
		implementing terms				
		of higher languages	no	no	no	yes
		(GOTO, FOR., DO, etc.)				
6.	Total number of instructions	modes	125x12	136x12	182x12	248x24
7.	Automatic program loading		yes	yes	yes	yes
8.	Technical control panel		yes	yes	yes	yes
						console subsyst.
9.	Number of operations per second (WHETSTONE in accuracy units)	1,000 op/sec	1.5	4.9	4.9	10.6
10.	Memory organizer and memory protection		yes	yes	yes	yes
11.	Input diagnostics	basic microdiagn.	no	no	no	yes
12.	Virtual addressing		64 KB	64 KB	64 KB	4 GB
13.	Processor for floating point and double accuracy		yes	yes	yes	yes
14.	Max. memory capacity (data in byte brackets = 64kx1 elements)		0.5 MB (2 MB)	0.25 MB	1.25 MB (4 MB)	8 MB (32 MB)
15.	Series communication module		yes	yes	yes	yes
16.	Parallel interface module		yes	yes	yes	yes
17.	Mutual compatibility	HW	yes	yes	yes	yes
		SW	upward same	upward same	upward same	at SZ level same
18.	Reconfiguration potential in emergency		no	partial	partial	partial
19.	Parts base utilized		SSI, HSI microprocessor series K 1804	SSI, MSI	SSI, MSI	SSI, MSI

Table 2. Comparison of computers using a common busbar

System	A architektura		B kategorie velikosti OP			C procesor s pohyb. p. č.	D možno. t. dalšího rozšíř.	E výroba od-do	F bilanço- vany počet
	16 bit	32 bit	32 k wds	128 k wds	> 0.5 MB				
SM 50/50 terminal station	+		+			-	-	od 1983	-
SM 4-20	+			+		optional	-	do 1986	-
SM 52/11	+			+		+	+	1983-87	-
I 102-F INDEPENDENT	+			+		+	+	od 1983	-
SM 50/50 frame type finish	+			+		-	+	1985-87	+
SM 52 11.M1 (M 16-23)	+				1 MB (4 MB)	+	+	od 1985	+
SM 50 50.M1 (M 16-22)	+				0.5 MB	+	+	od 1986	+
SM 52 12 (M 32-1)		+			8 MB	+		od 1988	+

\*Od = from; do = until

Key: A - Layout D - Potential for expansion  
 B - Working memory storage size category E - Production from-to  
 C - Processor w/floating point F - Budgeted computer

## ADT 4700 Minicomputer

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 3, 1984  
pp 326-334

[Article by Eng Pavel Kudrnovsky, Research Institute for Mathematical Machines,  
Prague: "ADT 4700 Minicomputer"]

### [Text] 1. Introduction

The ADT 4700 computer developed in the Research Institute for Mathematical Machines in Prague ranked among new computer technology products in 1983. In addition to finding application in the spheres traditionally covered by ADT computers, it is envisioned to use the ADT 4700 primarily in the function of a systemic processor of the IGS 2 interactive graphic station, where its small dimensions and compact mechanical finish will offer great advantage. Among other occasions, it was introduced in this application at the International Fair in Brno in 1983 and the "Electronization and Automation 83" exposition in Prague.

The ADT 4700 computer represents a technological design innovation of the preceding type ADT 4500. The objective of this innovation was primarily improved resistance and reliability with simultaneously reduced power input, reduced dimensions and weight of the computer's basic unit. In addition to these aspects, consideration was also given to the requirement for adapting the types of the employed semiconductor elements to the current trends in development of the parts base, the requirement for preserving the heredity of parts from the ADT 4500 in technically and economically justified cases and, finally, the obvious requirement of preserving the functional properties of the preceding type of computer, i.e., maintaining its program compatibility with the ADT 4500. Let us now examine some of the requirements placed on technological design innovation in closer detail:

#### Reduction in Dimensions

The key item from the viewpoint of volume is represented in the ADT 4500 by the power supply system. Space savings had to be sought during innovation primarily in this area. The power feed section uses DS type sources which differ from the preceding DBP series primarily in their smaller dimensions and more flexible adaptability to application requirements.

Reserve power feed is of an entirely new design dimensioned according to actual maximum demands of the computer's memory part: it takes up minimum volume, is simple and reliable. Reduction of dimensions was further achieved by a more effective spatial arrangement of the processor and redesign of several parts (plates) using viable semiconductor elements. An important step in technological innovation of the ADT 4500 was the integration of individual plates of the processor into one large area plate and its proposed connection to two blocks of standard plates. This arrangement meets the demand on maximum reduction of the length of data busbars and at the same time assures their minimum interaction.

## Improving Resistance

In addition to the compactness of its design, the computer's resistance is improved mainly by the elimination of interblock cabling, reduced number of connectors (single-plate processor), elimination of standard wire cabling and a simplified reserve power feed system. Of course, the employed parts base also played its role.

## Parts Base

From the viewpoint of the employed semiconductor elements--integrated circuits--improved reliability can be achieved in two ways: direct improvement of resistance by use of extremely reliable elements, and indirectly by using low power-input elements, which reduce power dissipation within the computer and, consequently, its operational temperature. In the redesign of the plates a line of adaptation of material requirements on a viable series of parts for electronics was followed. An irreplaceable position is held here by integrated circuits containing fast gates and three-state outputs.

## Viability of Design

The properties of the ADT 4700's structural arrangement can be used to their full extent also in viable functional innovation. This involves primarily the favorable properties of busbars, which thanks to their length and mutual position make it possible to accelerate the exchange of data between individual blocks of the computer and, consequently, the speed of data processing by the computer. The high speed of data movement along busbars depends on the utilization of fast and high-performance circuits with three-state outputs which control the movement of data along busbars.

Structural provisions were made in the computer for the introduction of an extremely fast microprogrammable two-way data transmission channel and for the potential connection of a parallel specialized processor.

No change has been made in the working memory storage plates and interface in comparison to the ADT 4500, because there is no compelling technical reason for undertaking any changes. The heredity of modules (plate types) in new systems--while maintaining the envisioned technical standards of these systems--is economically extraordinarily favorable from the viewpoint of both user and manufacturer. This applies primarily to interface plates, which in number of types many times exceed the number of types of plates in other parts of the computer, making a truly remarkable contribution.

In the innovation of other circuits (DMA, memory control unit, etc.), the requirement that the newly designed plate be usable in both the innovated ADT 4700 computer and its initial ADT 4500 version was stipulated.

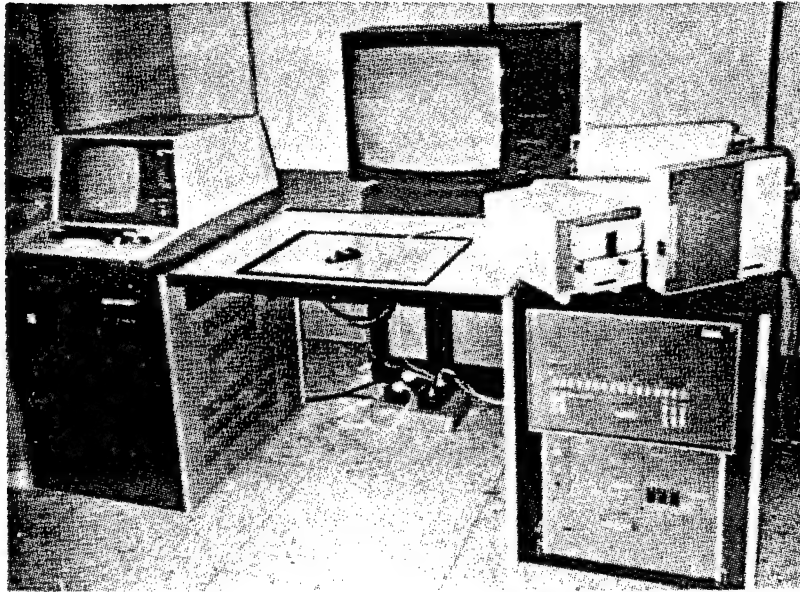


Figure 1. ADT 4700 (bottom right) in the IGS 2 system

## 2. ADT 4700 Characteristics

The ADT 4700 is a fast all-purpose computer with vertical microprogramming. It contains a control memory expandable to 10 K of 24-bit words and a fast semiconductor working memory storage expandable to 1 M byte. With regard to programming, it is fully compatible with the ADT 4500 and is intended for working under the same operating system in real time--the DOS IV. The same means for interconnection--interface plates--of peripheral systems are used as in the ADT 4500 computer.

### Microprogramming

In the microprogram processor all basic computer functions, such as loading the instruction register by machine instruction code, decoding and performance of machine instructions, processing of indirect addressing, maintaining the states of the control panel, etc., are provided by microprogram routines. The PROM modules on which the microprograms are stored are summarily called the control memory. The available standard microprograms take up 1,024 locations of the control memory and are arranged into four modules with 256 words each. A control memory word has 24 bits and is divided into five microinstructions. The structure of a control memory's word makes possible addressing in a 4,096-word address space. This address space of the control memory can be divided into 10 modules (0 to 15) with 256 words each.

The microprogram module physically forms six PROM memories located on the control memory plate. Microprograms for the performance of basic functions, including processing of the standard set of instructions, are assigned to the following modules:

- basic set of instructions (modules 0 and 1),
- floating decimal point instructions (module 14),
- expanded set of instructions (module 15).

The computer comes equipped with 128 standard instructions which can be expanded according to need by 38 instructions for control of the dynamic mapping system, by instructions implementing selected instructions of the FORTRAN language in firmware (FFP) and by instructions providing for fast processing of communication tasks in a computer network, also implemented in firmware. Contrary to the preceding type, the new computer provides better operational access to the use of new modules (PROM) in the control memory. For improving the effectiveness of preparation of new control memory modules during the development of specifically oriented systems, a set of hardware, firmware and software for design, tuning and use of instructions defined by the user is also made available.

#### Transcribable Control Memory

The ADT 4700 processor makes it possible to store microprograms written by the user into the transcribable control memory (WCS), the contents of which can be recorded from the main memory. This provides an effective tool for tuning user microprograms supported by programmable modules in the DOS IV operating system (microassembler, micro-debug-editor). Microprograms are run at the same speed and with the same effects as if they were located in the control memory made up of PROM elements.

The plate of transcribable control memory contains four control memory modules made up of RAM-type circuits. Each module has 256 24-bit words. The plate is placed into one of three positions reserved in the IF block for the control memory. Control, reading and recording into this memory is done by means of standard input/output instructions.

#### Dynamic Mapping System

The dynamic mapping system (DMS) makes it possible to expand the addressed space of the main memory from the standard 32,768 words to 1,048,570 words. Transformation into the expanded memory space is made by means of the so-called mapping registers. The DMS comes equipped with four sets of registers--four maps. One map is formed by 32 registers. The contents of each register define the number of a physical page. The maximum number of pages is 1,024. Only one map can be active at a given moment, whereby selection is limited to 32 pages of so-called logic memory. The resultant 20-bit address is then constituted by the composition of the contents of the mapping register (page address) and the contents of the address part of the instruction (address within a page). In view of the fact that the contents of mapping registers and map selection are programmable, it is possible to read a random address location within 1 M words. The DMS also facilitates the protection of individual pages against reading and recording and in so doing prevents interaction between system and user as well as among individual users.

## Inputs and Outputs

The connection of peripheral systems (disk, display, etc.) is done by means of interface plates, which are inserted into positions reserved in the IF block. An interface plate contains control and data circuits which create conditions conducive to signal connection of a periphery and its effective servicing. The connecting part of the computer--the IF block--has room for 16 interface plates. Each inserted plate takes up one V/V [input/output] address of the processor and can connect in a standard manner one peripheral system. Expansion of the number of connectable peripherals can be achieved by connecting an interface part expander--block EX--which is standard equipment for the ADT 4500 as well, or a switch-over for peripheral systems, which in addition to expansion of interface points also provides for their possible switching between two processors. All interface devices developed for the ADT 4500 can be used for the connection of peripheral devices.

Every reserved position represents a two-way program-controlled V/V data transmission channel serviced by a multilevel, vector-oriented interruption system.

Either of the two channels for direct access to the memory (DMA) can be assigned by the program to any V/V channel in the basic IF block and in blocks of expanders. The summary speed of data transmission by means of DMA is 616.6 K words per second.

## 3. ADT 4700 Specifications

The following data characterize in a rough outline the computer's properties:

Central processor

address space	2,048 words (direct addressing) 32,768 words (indirect addressing) 1,048,576 words (w/dynamic mapping system)
---------------	---------------------------------------------------------------------------------------------------------------------

word length	16 bits
-------------	---------

number of standard instructions	128
---------------------------------	-----

Types and numbers of instructions

memory-oriented	14
register-oriented	43
inputs and outputs	13
expanded arithmetic unit (EAU)	10
index-register	32
oper. w/bits, syllables and words	10
floating decimal points	6
number of registers	20
accumulators	two 16-bit (A, B), addressed either explicitly or as address locations 0, 1
index-registers	two 16-bit (X, Y)



main memory control	one 16-bit (T)
program control	one 15-bit (M)
supplementary	one 16-bit (P)
displaying	two 1-bit (O, E)
recording	one 16-bit
	twelve 16-bit
Control processor	
address space	4,096 (16 modules with 256 words each) or 16,384 (64 modules with 256 words each)
word length	24 bits.
word types	4
number of microinstructions in word	5
microinstruction cycle	325 ns
microinstructions	180
Types and number of microinstructions	
operation	15
special	32
ALU and condition	68
store	32
C-bus	32
change in jump direction	1
binary loaders	two residential PROM (perforated tape and disk, two user optional)
dynamic mapping system	DMS
address space	1,048,576 words
program integrity protection	page protection against unauthorized recording and reading
memory cycle	650 ns
control	38 machine instructions
memory mapping	4 dynamic substitutable maps--2 for program runs (systemic and user), 2 for DMA. Permits communication with memory areas separated from memory areas with programs. Data transmission can occur from and to physically discontinuous memory blocks
mapping registers	each map contains 32 12-bit mapping registers
interruption during parity error	yes
inputs/outputs	V/V
structure of interruption system	multilevel vector-oriented, priority is determined by interruption location
interface plate format	single (150x140 mm)
	double (300x150 mm)

number of layers	4, 6 or 8
number of connectable V/V plates	16 plates of single or 8 plates of double format in processor unit
number of connectable V/V plates in expander	16 plates of single or 8 plates of double format
direct access to memory	DMA
number of channels	2
length of transmitted word	16 bits
max. length of transmitted block	32,768 words
assignment to V/V addresses	DMA transmission can be assigned to two random V/V channels
transmission speed	616,660 words per second maximum
 Dimensions	
width	483 mm (19")
height	310 mm (7U)
depth	660 mm
 Power feed	
network power feed	220 V + 10 percent, - 15 percent
frequency	50 Hz + 1 Hz
power input	500 VA (typical value)
number of power source blocks	2
type	DS 105 105 05B and DS 105 12B 16H
feed levels for memories and processor	5V/40A, 5V/10A, 12V/1A, -5V/1A
feed levels for interface plates	5V/18A, -5V/1A, 12V/3A, +15V/1A, -15V/1A
reserve feed	24 V battery
 Memory system	
type	16K N-MOS semiconductor RAM (MHB 4116)
word length	16 bits + parity bit
configuration	memory control unit + memory plates
memory capacity of plate	128 K byte
max. number of memory plates	8
page size	1,024 words
address space	32,768 words w/o DMS, 1,048,576 w/DMS
duration of memory cycle	650 ns
detection of parity error	all words read from the memory are monitored. Selection is made of either ignoring parity error detection or of HALT. Interruption is generated during parity error with the use of memory protection.

#### 4. Structural Arrangement

As was already pointed out, in the selection of the spatial arrangement of components the designers' objective was to find a mutual position of partial circuits of the computer that would, among other things, shorten the length of its busbars. The result of their efforts can be seen in Figure 2, representing the spatial arrangement of the computer's parts.

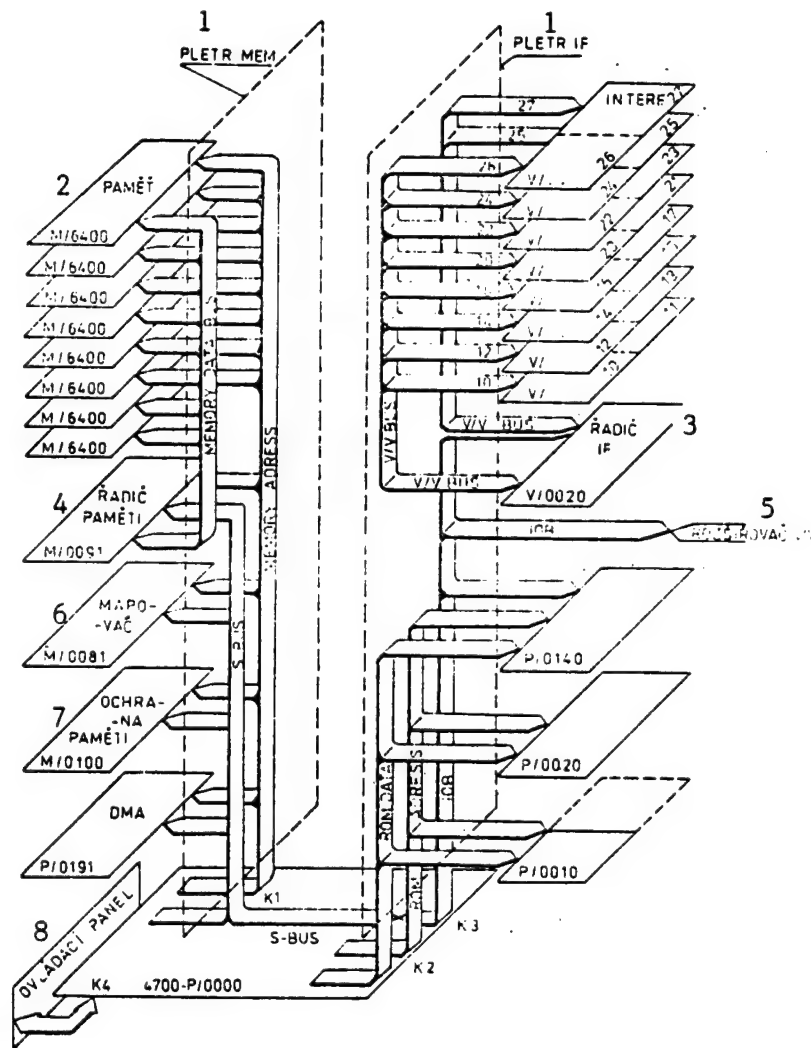


Figure 2. Spatial arrangement of ADT 4700 computer parts

- |                               |                          |
|-------------------------------|--------------------------|
| Key: 1. Printed circuit plate | 5. Input/output expander |
| 2. Memory                     | 6. Mapper                |
| 3. Control unit               | 7. Memory protection     |
| 4. Memory control unit        | 8. Control panel         |

The large area processor plate (4700-P/0000) forms the core of the computer. Connected to this 8-layer plate measuring 420x357.2 mm by connector K1 is the

printed circuit plate of the MEM block and by a pair of connectors K2 and K3 the printed circuit plate of the IF block. Connector K4 serves for connecting the computer's control panel. Blocks IF and MEM represent structural parts intended for emplacement of all the computer's plates except the large processor plate. The printed circuit plates of these blocks, 8-layer plates with printed circuits, replacing the standard wire cabling, feed signals to individual plates in the blocks.

In addition to the partially or fully filled space for the working memory storage (modules designated 4500/M/6400), the MEM block also contains the following circuits: DMA (4500-P/0191), memory protection (4500-M/0100), mapper (4500-M/0081), and the memory control unit (4500-M/0091).

The IF block is divided into two parts: in the lower part is space reserved for the control memory, and the upper part is intended for interface circuits.

One of a pair of connectors horizontally arranged side-by-side in the lower part of the IF block is always connected to conductors of the control memory's busbar (ROM DATA and ROM ADDRESS) and the second one to an interface busbar (IOB). The space reserved for control memory can be filled with plates having varying memory capacity. This capacity is implemented by PROM circuits type MH 74S287 or MH 74S571 and can range from 256 to 5,120 24-bit words per plate (P/0010 or P/0020).

In these positions can also be accommodated a RAM-type control memory with a capacity of 1,024 words/24 bits (P/0140), the configuration of which makes the best of its spatial proximity to the interface busbar and the control memory's busbar. The RAM type control memory is designed on an 8-layer double format plate. Recording to the control memory's contents (operation with contents) makes use of the plate's connector connected to the interface busbar. The second connector is used for addressing and reading data when the plate functions as control memory.

The space for interface plates contains 16 V/V addresses (10, 11, ... 27 octal), on which can be placed at random 16 simple interface V/V modules--interface plates of single format--or 8 plates of a similar nature but of double format (V/...). This space is structurally adapted to make it possible to combine both formats according to need.

The figure also indicates the spatial arrangement of the computer's individual busbars. The central busbar--S bus--connects the processor circuits located on the large plate primarily with the DMA, memory protection, mapper and memory control unit. Another busbar of principal importance, the MB bus (MEMORY ADDRESS), feeds the memory address into the memory control unit's circuits, whereby part of this busbar is terminated as early as in the mapper, depending on circumstances. The source of information for this busbar is alternately the processor or DMA.

Data for recording or reading are transmitted between the memory control unit and the individual M/6400 memory modules of means of the MD busbar (MEMORY DATA).

The IOB interface busbar contains both input and output data routes and all the controlling interface signals. The source or receiver of signals is on the one hand the processor, and on the other hand the control unit of the V/0020 interface block. When there is a need for expanding the number of positions reserved for inputs and outputs, several V/V expanders can be connected to the IOB busbar.

The busbars connecting reserved input/output positions with the interface control unit (V/V busbar) contain data, address, and control signals which serve for controlling specific V/V interface systems.

The control memory busbar is extremely short and consists of address conductors (ROM ADDRESS) and data conductors (ROM DATA).

The computer comes equipped with a simple power supply switch located in the unit's rear panel out of direct reach of the control panel operator. In routine operation the switch can stay in the "on" position while the system in which the computer is installed is turned on and off. The computer also contains circuits that automatically bring it into operational state once the network power feed is turned on.

#### Budgeting of Computer Systems

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 3, 1984 349-350

[Text] Budgeting directions were published this year with considerable delay and their text was not available for a long time. We therefore publish a substantial part of Instruction No 2/1984/500, ref no 500/843/84 of 11 April 1984 for Budgeting and Projecting Needs for Computer Systems for the Years 1985-1987, published by FMEP [Federal Ministry of Electrotechnical Industry] on the basis of CCSR Government Resolution No 319/1982.

1. The subject of budgeting at the sectoral level (central balance "U), balancing body FMEP, are the JSEP [uniform system of electronic computers] computer systems:

- EC 1011--producer Hungary
- EC 1027--producer CSSR
- EC 1032--producer Poland
- EC 1045--producer USSR
- EC 1055--producer GDR.

The subject of budgeting at the middle management level (enterprise balance "V"), balancing body VHJ ZAVT [economic production unit Automation and Computer Technology Enterprises], are SMEP [system of small electronic computers] computer systems and the EC 1026 computer of CSSR production:

- EC 1026
- SM 4-20
- SM 52/11

--SM 50/50--in frame variant  
--SM 52/11.M1 (orig. oper. designation M 16-23)  
--SM 50/50.M1 (orig. oper. designation M 16-22)--as of 1986  
--SM 53/10.

2. The budgeting process remains broken down into 3 years, its basis is the balance specification for 1984 issued by FMEP in September 1983, specifically the parts for 1985 and 1986. The result will be a balance of computer systems budgeted for 1985, detailed outlook for 1986 and the outlook for 1987 in accordance with new requirements.

3. The basic documentation, emphasizing the selection of the type of computer, is a properly filled out "Outline of Preparations for Computer Application" (hereafter "Outline") issued by FMEP under ref no 500/42/80.

4. The procedure for reporting requirements for computer systems budgeted at the middle level of management (enterprise balance "V"):

--customer organizations make their requirements known to the pertinent NOTO [National Technical Service Organization] organization (in CSR Office Machine fiduciary concern organization--Trade Policy Department, 15 28 October Street, 111 90 Prague 1, telephone 26 10 70; in SSR Datasystem fiduciary concern organization--Marketing and Computer Systems Complementation Department, 4 Stefanic Street, 815 69 Bratislava, telephone 432 70), specifically:

--requirements for delivery of computers in 1985 are submitted by users in keeping with the budgeting outlook from specifications of the balance for 1984. If the "Outline" had already been processed as part of plan preparation, requirements are submitted in the form of a letter, the "Outline" to be submitted only in case of major changes or extraordinary new requirements;

--requirements for delivery of computers in 1987 are submitted on the "Outline" form (one copy), including approval by a superior organ;

--NOTO organizations will discuss the requirements with customers and propose a substitute solution. A protocol will be compiled about the proceedings in accordance with paragraph 12 of Decree No 48/80, SBIRKA ZAKONU;

--NOTO organizations submit to the general management of ZAVT a summary of requirements for the years 1985 through 1987 and a proposed distribution of computers budgeted for 1985 together with protocols of discussion of the requirements and proposals;

--the general management of ZAVT will compile a balance for 1985 and notify the central consumer organs about the determined funding requirements.

5. The procedure for reporting requirements for computer systems budgeted at the sectoral level (central balance "U"):

--customer organizations make their requirements known through their central links of management via central organs (sectors) directly to the balancing body FMEP as follows:

--for the years 1985 and 1986 in keeping with the budgeting outlook that forms a part of FMEP balance specifications for 1984. The "Outline" will be submitted only in case of extraordinary requirements not listed in the budgeting outlook;

--requirements for 1987 are submitted on the "Outline" form (three copies);

--central organs will submit to FMEP a list of requirements for their sector, specifically:

--in the form of a letter with certification of the requirements for delivery listed in the budgeting outlook for 1985 and 1986 that forms a part of FMEP balance specifications for 1984, with certification by the relevant bodies of the central organ about investment coverage of the requirements (for 1985);

--deliveries of computers in 1987 and extraordinary requirements for deliveries in 1985 and 1986, i.e., not listed in the budgeting outlook, call for submission of the "Outline" form (three copies);

--intersectorial discussion of requirements will progress prior to submission of the economic implementation plan for 1985;

--FMEP will compile the balance for 1985 and undertake its specification to central customer organs in accordance with paragraph 14, section 2 of Decree No 48/80, SBIRKA ZAKONU, and provide information about any changes in the course of the year.

The instruction is valid as of 1 April 1984. Detailed information can be obtained from NOTO organizations (at the listed addresses) or directly from the plan and balancing department of FMEP, 7 King Charles Square, 120 07 Prague 2.

#### Soviet Display Subsystem

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 3, 1984  
369-375

[Article compiled from Soviet documentation by Eng Pavel Kratochvil: "Display Subsystem EC 7920"]

#### [Text] 1. System Description

The EC 7920 subsystem has been produced in the USSR and supplied to the CSSR since 1981. It can be connected to a standard JSEP channel. In the past it used to be connected to the EC 1033, M 4030 and EC 1025 computers; currently it is connected to the EC 1045 and EC 1026 computers.

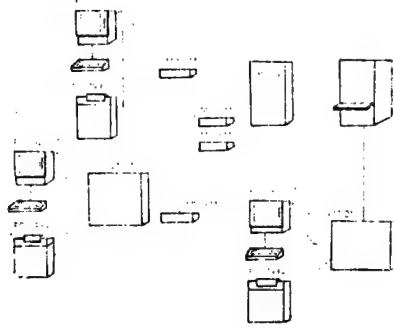


Figure 1. EC 7920 display system

The EC 7920 subsystem represents a set of devices for input and output of information which facilitates effective operation by multiple operators. The subsystem consists of a control unit and up to 32 peripheral devices (display units with keyboard and light pen or dot matrix printers). In its basic configuration the control unit contains three 4T adapters making possible the connection of 12 peripherals. The control unit can contain up to eight 4T adapters. A 4T adapter facilitates the connection of our peripheral devices. Depending on its type, the control unit can be connected either to a JSEP input/output channel (local variant) or by means of telephone channels (remote variant).

The subsystem includes the following types:

EC 79-00: Local group subsystem with buffer memory capacity of 480 symbols and transmission speed of 200 kbyte/s.

It includes the following devices:

EC 7922-00 control unit,  
EC 7934-00 printer.

EC 7920-01: Local group subsystem with buffer memory capacity of 1920 symbols and transmission speed of 200 kbyte/s.

It includes the following devices:

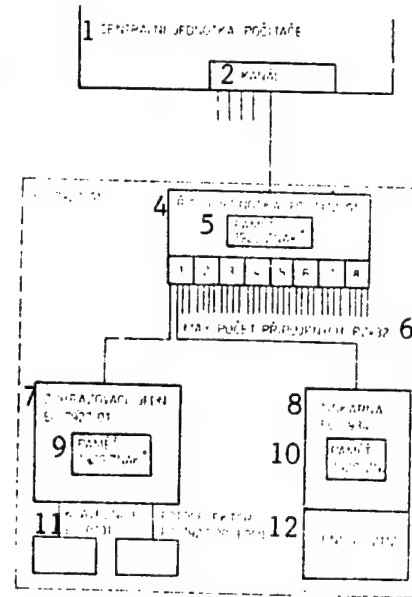
EC 7922-01 control unit,  
EC 7929.01 display unit,  
EC 7934-01 printer,  
EC 7927.00 display unit,  
EC 7934-00 printer.

EC 7920-10: Remote group subsystem with buffer memory capacity of 480 symbols and transmission speeds of 600, 1,200, 2,400 and 4,800 bits/s.



Figure 2. EC 7920-01. Local group system with buffer memory capacity of 1,920 symbols

- Key:
1. Computer's central unit
  2. Channel
  4. EC 7922-01 control unit
  5. 1,920 symbol memory
  6. Max. number of connected peripherals 32
  7. DisplayUnit
  8. Printer
  9. 1,920 symbol memory
  10. 1,920 symbol memory
  11. Keyboard
  12. Photoselector



It contains the following devices:

- EC 7921-00 control unit.
- EC 7929-00 display unit,
- EC 7934-00 printer.

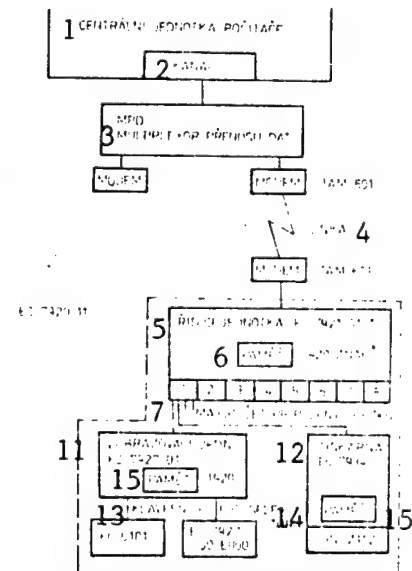
EC 7920-11: Remote group subsystem with buffer memory capacity of 1,920 symbols and transmission speeds of 600, 1,200, 2,400 and 4,800 bits/s.

It includes the following devices:

- EC 7921-01 control unit,
- EC 7929.01 display unit,
- EC 7934-01 printer.
- EC 7927.00 display unit.
- EC 7934-00 printer.

Figure 3. EC 7920-11. Remote group system with buffer memory capacity of 1,920 symbols

- Key:
1. Computer's central unit
  2. Channel
  3. Data transmission multiplex
  4. Line
  5. EC 7921-01 control unit
  6. Memory 1,920 symbols
  7. Max. number of connected peripherals 32
  11. Display unit
  12. Printer
  13. Keyboard
  14. Photoselector
  15. Memory



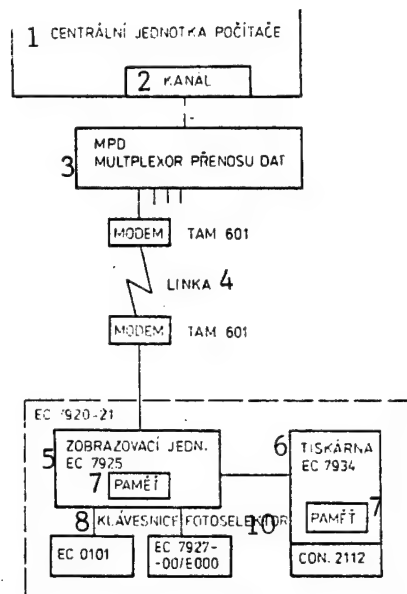
EC 7920-21: Remote independent subsystem with buffer memory capacity of 1,920 symbols.

It includes the following devices:

EC 7921-01 display unit,  
EC 7934-02 dot matrix printer.

Figure 4. EC 7920-21. Remote independent system with 1,920 symbol buffer memory capacity

- Key:
1. Computer's central unit
  2. Channel
  3. Data transmission multiplex
  4. Line
  5. Display unit
  6. Printer
  7. Memory
  8. Keyboard
  10. Photoselector



One of the following contactless keyboards can be connected to each display unit:

- EC 0101-1-01 operator's desk,
- EC 0101-1-02 Cyrillic alphabet data acquisition,
- EC 0101-1-03 Cyrillic alphabet typewriter,
- EC 0101-1-04 general purpose, Latin alphabet.

Attached to each display unit is a light pen bearing the designation EC 7927-00/E000.

## 2. EC-7922 Control Unit

The EC-7922 control unit is manufactured in two variants with differing capacity of its buffer memory (Table 1).

Table 1. EC-7922 Control Unit

Designation	Nomenclature	Buffer memory capacity	Connectable peripheries	
			Nomenclature	Device
3.057.036-00	EC-7922-00	480 symb	EC-7927-00	Display unit
			EC-7934-00 variant 09	Dot matrix printer
3.057.036-01	EC-7922-01	1,920 S.	EC-7927-01	Display unit
			EC-7927-00	Display unit
			EC-7934-00	Dot matrix
			variant 09	printer
			EC-7934-01 variant 09	Dot matrix printer

In view of the envisioned configurations of the EC-7920 system in the CSSR, the TP text of the local system is oriented toward the following configuration:

EC-7922-01  
EC-7927-01  
EC-7934-01

The EC-7922-01 control unit provides for the transmission of information between the display unit, dot matrix printer (up to 32 connectable peripheral devices in a random ratio), and a JSEP computer via JSEP input/output channels. The EC-7922-01 control unit can be connected to a selector multiplex (byte-multiplex or block-multiplex) JSEP channel. The control unit can operate with a byte-multiplex channel both in forced continuous mode and in multiplex mode. Connection with a JSEP channel is implemented via JSEP input/output interface.

The control unit design is based on integrated circuits of the 155 and 131 series, on highly integrated circuits (buffer memory and code converters) and on discrete components.

### 3. Technical Data

The system is designed for continuous operation with the possibility of multiple switching on and off in the course of a day. Maintenance of the system is carried out in accordance with the instructions for its maintenance. It is possible to connect up to 32 peripheral devices to the EC-7922-01 control unit (display units or dot matrix printers in a random ratio). Peripheries are connected by the PK-75-4--12 coaxial cable up to a distance of 1,200 m. Transmission speed between the control unit and peripheries is 760-864 kbit/s.

The speed of transmission of information between the control unit and a JSEP channel is up to 200 kbyte's. Information between the channel and the control unit (RJ) is transmitted in DKOI (EBCDIC) code.

The EC-7922-01 RJ controls information coming from the channel and from peripheral systems (PZ) and that read from the internal buffer memory. Thanks to its internal buffer memory, the EC-7922-01 RJ can exchange data with the channel at random speeds up to the maximum speed without loss of information. Thus, the system can be connected to a multiplex channel with random priority.

The EC-7922-01 RJ performs the following basic functions:

1. It tests whether the connected P2 send requests for service.
2. Coordinates exchange of information between computer and PZ.
3. Ensures that transmission of information between channel and RJ follows the JSEP input/output interface norm.
4. Provides for transmission of information with PZ in keeping with the employed interface for connection with the PZ.
5. Controls operation of PZ. Provides for parallel performance of instructions and orders coming from the computer.
6. Accumulates, decodes, encodes and processes received and transmitted information.
7. Balances speed of data transmission between computer and RJ and between RJ and PZ.

It uses an autonomous power feed system. It is fed from a single-phase a.c. network 220 V, + 10 percent - 15 percent, with 50 Hz frequency. The required power input does not exceed 0.35 kVA. It is switched on locally or centrally by means of a power-feed interface from the computer.

It is structurally designed as a single-frame box with dimensions (length x width x height) 1,200 x 550 x 1,050 mm. Its weight is less than 215 kg. Average trouble-free service life is 1,000 hours.

#### 4. EC-7921 Control Unit

The EC-7921 control unit comes in three variants with differing capacity of memory as shown in Table 2.

Table 2. EC-7921 Control Unit

Designation	Nomenclature	Buffer memory capacity	Connectable peripheries	
			Nomenclature	Device
3.057.035-00	EC-7921-00	480	EC-7927-00	Display unit
			EC-7934-00	Printer
3.057.035-01	EC-7921-01	1,920	EC-7927-00	Display unit
			EC-7927-01	Display unit
			EC-7934-01	Printer
3.057.035-02	EC-7921-02	1,920	EC-7927-02	Display unit
			EC-7927-03	Display unit
			EC-7934-01	Printer

The offered configuration of the EC-7921 system is:

EC-7921-01  
EC-7927-01  
EC-7934-01.

The EC-7921-00 (EC-7921-01, EC-7921-02) control unit is designed for providing exchange of information between PZ (display unit, dot matrix printer) and a JSEP computer along a selected telephone channel. Connection with the computer is provided by means of a selected telephone line with the use of synchronous modems and a data transmission multiplex. The MPD-3 (EC-8403) with CA2 adapter is used for EC-7921-00 and EC-7921-01.

The control unit is designed on integrated circuits of the 155 and 131 series, on high-integration circuits (buffer memory and code converters) and on discrete components.

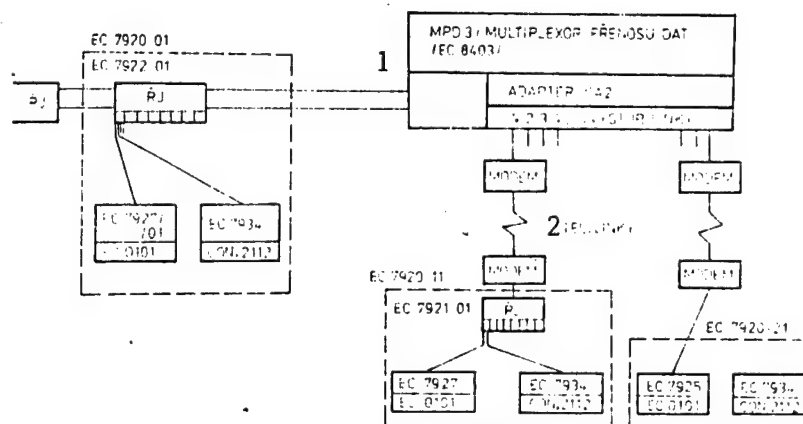


Figure 5. Connection of EC 7920 subsystem to EC 1033

Key: 1. Data transmission multiplex 2. Telephone lines

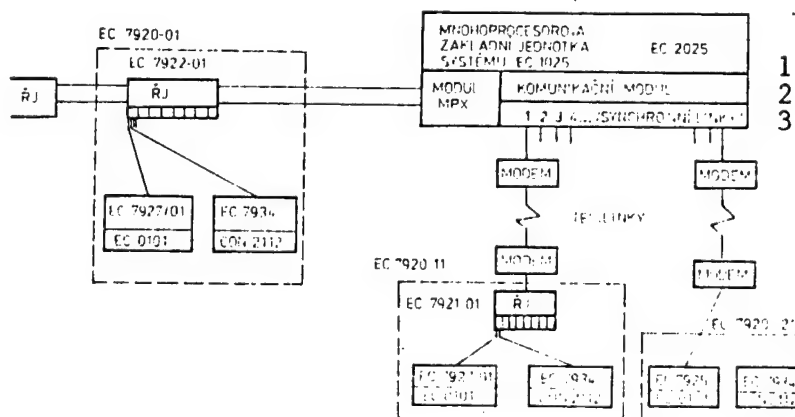


Figure 6. Connection of EC 7920 subsystem to EC 1025

Key: 1. Multiprocessor basic unit of the EC 1025 system  
2. Communication module  
3. Synchronous lines

## 5. Technical Data

The system is designed for continuous operation with the possibility of multiple switching off and on in the course of a day. System maintenance is carried out in accordance with the instructions for maintenance.

Up to 32 peripheral units (display units or dot matrix printers) can be connected to the EC-7921-01 control unit in random order. The peripheries are connected radially by the PK-75-4-12 coaxial cable up to a distance of 1,200 m. The speed of transmission between RJ and peripheries is 760-864 kbit/s.

The control unit provides for the synchronous transmission of information. Transmission speeds on the line are 600, 1,200, 2,400 and 4,800 bit/s. Information between the channel and RJ is transmitted in KOI-7 code. The EC-7921-91 RJ controls information coming from the channel, from the peripheries and also controls information read from its internal buffer memory. The RJ provides longitudinally transverse control during exchange of information with the channel.

The RJ uses an autonomous power feed system. It is fed from a single-phase a.c. network 220 V, + 10 percent - 15 percent, with 50 Hz frequency. The required power input does not exceed 0.35 kVA. The RJ is switched on locally or centrally by means of a power-feed interface from the computer. Structural design of the system (RJ) takes the form of a single-frame box of dimensions (length x width x height) 1,200 x 550 x 1,050 mm. RJ's weight does not exceed 240 kg.

### CSSR Robots, Manipulators

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 3, 1984 390-392

["Current State of Development of Industrial Robots and Manipulators in the CSSR"; lecture selected from seminar presentations indicated below]

[Text] A nationwide specialized seminar--Course on Robotics for Science and Technology Journalists--was held on 1-2 December 1983 in Malacky. The lecturers who participated in discussions with the journalists included Prof Eng Vaclav Kalas, DrSc, corresponding member of SAV [Slovak Academy of Sciences], head of the Chair of Automation and Control, School of Electrotechnical Engineering, Slovak Institute of Technology in Bratislava; Doc Eng Ivan Plander, DrSc, director of the SAV Institute of Technical Cybernetics in Bratislava; the head of trade unions in VUKOV [Metallurgical Industry Research Institute]; representatives of general engineering enterprises, and others.

From among the lectures presented at this seminar we selected for our periodical a lecture on the theme listed in the title.

A coordinated and systematic research and development of industrial robots and manipulators (PRaM) in the CSSR commenced during the Sixth 5-Year Plan in 1976 through dealing with the state project entitled "Series of Modular Industrial Robots and Manipulators." A type series of PRaM for handling of parts weighing from 1 to 160 kg was developed during the listed period on a modular basis and using primarily the domestic base of elements and key final assembly devices. The type series represents one of the most viable directions in designing unified PRaM systems worldwide--modular design.

#### 1.1 Basic Representatives of the Type Series:

--PR-4 industrial robot with pneumatic drive designed for automation of operational handling of parts weighing up to 4 kg in shaping and machining technology and in related handling technologies (developer VUSTE [Engineering Technology and Economy Research Institute] Prague, producer ZPA [Industrial Automation Plants] Presov);

--PR-16 P industrial robot with pneumatic drive designed for automation of operational handling of parts weighing up to 16 kg in shaping and machining technology and in related handling technologies (developer VUKOV Presov, producer ZPA Presov);

--PR-32 E industrial robot with electric drive designed for automation of technological and demanding operational manipulation (electric arc and resistance welding) of objects weighing up to 32 kg (developer VUKOV Presov, producers ZTS [Heavy Engineering Plants] Detva and ZEZ [Electrothermal Systems Plants] Prague, Horice branch);

--M 63 modular manipulation system--a modification of portal, columnar pillar manipulators with hydraulic drive designed for operational handling of parts weighing between 20-63 kg, particularly in machining flange and shaft type parts, pressure casting and for construction of automated production systems with PRaM (developer VUKOV Presov, producers Vihorlat Snina, ZTS Kosice (Bardejov branch), TOS [Machine Tool Plants] Trencin).

#### 1.2 PRaM Developed Outside of the Type Series:

--MX assembly loading units with pneumatic drive (four types), carrying capacity 1 to 2 kg (developer VUMA [Mechanization and Automation Research Institute] Nove Mesto nad Vahom);

--PMS and PMZ type manual manipulators with graduated carrying capacity from 110 to 250 kg (development and production SKODA Ostrov nad Ohri);

--SPR 5 industrial robot for spraying of coatings (development URSST [Institute for Development of Engineering Consumer Products] Piestany, producer SAM [Slovak Armatures] Myjava);

--RMS 63 manual manipulator with hydraulic drive (development and production BAZ [Bratislava Automobile Plants] Bratislava);

--PROB 10 industrial robot with hydraulic drive (development and production CZM [Czech Motorcycle Plants] Strakonice).

### 1.3 Adaptive Industrial Robots and Unified Manipulators

Research and development of PRaM-type manipulation systems and robotized technological processes is currently being implemented through the state R&D project "Adaptive Industrial Robots and Unified Manipulators" conducted in 1981-85 under coordination by VUKOV Presov. Implementation of the state project is participated in by R&D base organizations professionally oriented toward individual technological areas of application of PRaM and R&D base producers of PRaM.

#### Unified Manipulators

--AM 5 automatic manipulator, joint USSR-CSSR development, pneumatic drive, carrying capacity 2.2.5 kg, applications in planar forming technology (development VUKOV Presov and ENIKMASH Voronezh, production ZPA Presov since 1983);

--AM IT automatic manipulator, electromechanic drive, applications in planar forming technology (development VUKOV Presov, Production ZPA Presov since 1983);

--MTL 10 automatic manipulator, joint CSSR-USSR development, hydraulic drive, application in automation of pressure casting machinery (development VUKOV Presov and NIISL Odessa, production Vihorlat Snina);

--M 40 manipulator, carrying capacity 40 kg, pneumatic drive, designed for planar forming of large pressings and cuttings, simple handling of large-dimensional tabular parts (development VUKOV Presov, production BAZ Bratislava since 1983);

--Type 20 and IPR 8 integrated PRaM for machine tools, hydraulic drive. Development is progressing together with development of new types of machine tools in VHJ TST [Engineering Technology Plants economic production unit] (AM 20 development VUKOV Presov, production TOS Trencin as of 1986; IPR 8 development VUOSO [Machine Tools and Machining Research Institute] Prague, production TOS Rakovnik as of 1986);

--UM 160 all-purpose manipulator, joint CSSR-USSR development, carrying capacity 160 kg, portal design, hydraulic drive, intended for automation of interoperational and operational handling, operating several machine tools, automation of production processes and automated production lines (development VUKOV Presov and ENIMS Moscow, production Vihorlat Snina as of 1984).

#### Adaptive Industrial Robots

--APR 2.5 adaptive industrial robot, carrying capacity 2.5 kg, electric servo-drive, intended for performance of technological manipulations in production processes, particularly in assembly operations (development VUKOV Presov, production ZPA Presov as of 1987);

--SPR 10 industrial robot for surface finishing, carrying capacity 10 kg, hydraulic drive, intended for forming automated work stations for surface finishing (development URSST Piestany, production SAM Myjava);



--APR 20 adaptive industrial robot, carrying capacity 20 kg, electric drive, designed mainly for arc welding technology (development VUKOV Presov, production ZTS Detva as of 1986);

--APR 40 adaptive robot, carrying capacity 40/80 kg, electric drive, designed for spot welding and complicated spatial manipulation (development VUSTE Prague, production ZEZ Prague, Horice branch as of 1986);

As part of the development of control systems, sensors, and their elements the following were or are being developed:

--RS 1 A control system for control of purpose-oriented manipulators (development and production VUKOV Presov as of 1984);

--RS 1 C control system based on the SM 50/40 microcomputer for control of manipulators and robots with impact metering (development VUKOV Presov and VUVT [Computer Technology Research Institute] Zilina, producers ZPA Presov and ZVT [Computer Technology Plants] Banska Bystrica since 1982);

--RS 2 control system based on TESLA NS 900 and NS 910 programmable automatic systems with cyclic control (development TESLA Kolin and ZPA Presov since 1978);

--RS 3 control system based on the SM 50/40 system with the use of microprocessors, for PRaM with positional and routing control and possible linear interpolation (development VUKOV Presov and VUVT Zilina, production ZPA Presov and ZVT Banska Bystrica since 1981);

--RS 4A control system with potential communication with sensor subsystems for adaptive industrial robots based on the SM 50/40 system (development VUKOV Presov and VUVT Zilina, production ZPA Presov and ZVT Banska Bystrica as of 1986);

--BIP 48, BIP 24, BIP 24 M, BMF-01, BMP-02 contactless position sensors (development VUKOV Presov, production VUKOV and ZPA Presov);

--BFT temperature sensor (development and production VUKOV Presov since 1983);

--Sensor subsystems for positional adaptivity in welding, moment of forces visual subsystems, particularly for assembly (development VUKOV Presov, UTK [Institute of Technical Cybernetics] of SAV Bratislava, VUZ [Welding Research Institute] Bratislava, VUT [Military Institute of Technology] Brno);

Together with the development of PRaM is progressing also the development of systems for interoperational and operational manipulation and development of other components promoting the construction of robotized technological work stations (RTP) and production systems:

--Automated suspension lines intended for interoperational transport with a carrying capacity of 250 kg (development VUKOV Presov, VUSAPL [Research Institute for Processing and Applications of Plastics] Nitra, production Strojsmalt Medzev as of 1986);

--Stepping transporters of modular design with carrying capacity of 200 and 500 kg (development VUKOV Presov, production Strojsmalt Medzev since 1983);

--Operational manipulation devices--containers, turners, traversing units, gripping devices, etc. (development RTP designers, production VUKOV Presov, Strojsmalt Medzev and RTP builders);

--Welding systems for arc and spot welding RTP--welding heads, pliers, power sources, weld positioners, etc. (development VUZ and BEZ [Bratislava Electro-technical Plants] Bratislava, ZTS Detva, production BEZ Bratislava and ZTS Detva, gradually since 1983);

--Methods and devices for testing of PRaM and manipulation systems. Their development is progressing together with the development of individual systems for robotization of the production process (development and production VUKOV Presov, gradually since 1983).

Progressing together with the development of PRaM, starting with the Sixth 5-Year Plan, is the establishment of RTP used to verify approaches to robotization of production processes, operational properties of the developed PRaM and conditions for their repeated use.

Current development and implementation of RTP of modular structure and use of PRaM groups is intended to find application in production lines and systems.

#### Leipzig Exhibit

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 3, 1984 pp 397-399

[Article by Josip Rajman: "From the Leipzig Fair 1984"]

[Text] The GDR exhibit at the Leipzig Spring Fair was characterized on the one hand by an "explosion" of microelectronics and, on the other hand, by emphasis on the applicational aspects of computer technology ahead of demonstration of technical systems.

There are more than 43,000 microprocessors in operation in the GDR at the present time. Production of electronic parts has tripled over the past 6 years--from 575 million in 1978 it increased to M 1.724 billion. These parts also form the basis for 32,000 industrial robots that are to be produced in the near future. The Robotron combine alone will turn out approximately 5,000 of them by 1986.

The joint exhibit of the Robotron, Microelectronic, Communication Electronics and other enterprises demonstrated the application of these systems in the area of production management, public administration, banking, postal communications, and transportation, and the exhibit of applications in medicine was particularly lavish.

From the total of approximately 100 gold medals the Robotron combine captured two--one for the K 6312 hardcopy printer and one for the M 3003 tester of printed circuits. Robotron's TR 20 calculator, which is exported to Western countries, was awarded a diploma for outstanding design. Other two gold medals went to Moscow's Energopribor for the SM 1300 microcomputer and to the Japanese Mitsubishi company for a videoprinter built into a television set. The latter company obtained another medal for the RM 501 Movemaster microrobot. The Notia Robotics company of Helsinki also received the highest award for its robot, and the East German Numeric enterprise of Karl Marx Stadt for its IRS 700 K control system.

Awards from among reprographic systems went to the PC 20 copier of the Cannon company and the OCE's company 685 ozalith copier.

#### GDR

Of Robotron combine's production, 70 percent go for exports, 90 percent of them to socialist countries. According to a new contract it will export R 108 million worth to the USSR. It exports annually to the USSR approximately 80 large systems, such as the EC 1055M, in exchange for imports of computer technology, including the EC 1035 computer system.

The newest Robotron systems include the Z 9001 home computer with a 22 to 38 KB RAM and 4 to 20 KB ROM memory, the K 8924 bank terminal with up to 60 KB memory and various systems for reading of magnetic strips. The new 1715 book-keeping machine operates with a 16 to 32 KB memory and a display tube with a capacity for 64x16 symbols. Attached to it is a printer, either dot matrix or daisy wheel. The improved PHM 41 industrial robot has five or six stages of motive zones and can operate with up to 0.5 kg loads.

The Mikroelektronik combine exports to France electronic parts such as e.g., quartz watches, systems for production of microcomponents and for vacuum technology. Chess computers are also a subject of exports. The improved Chess Master was awarded second prize in last year's international competition in Budapest. Exhibited at the fair were approximately 20 chess computers from the United States, Great Britain, FRG, Hong Kong, Denmark, Romania and Hungary.

The Robotron combine also exhibited its new HC 900 home computer based on a GDR microprocessor. Its display has 320x256 points and a 20 KB memory. The exhibit was complemented by electronic calculators, e.g., the MR 412 pocket calculator with 16 functions, display and liquid crystals for 8 digital symbols and a battery with a 2-year service life.

#### Bulgaria

Of interest in the Bulgarian exhibit was the EC 8506 multidisplay station with eight terminals that come equipped with a color display and a printer, and the SM 1605.M1 miniterminal with 128 bytes of intermediate memory. The terminal weighs a mere 9.6 kg and its dimensions are 410 x 375 x 167 mm. The newly introduced disk unit with an 80 KB capacity bears the designation SM 5412.

The EVMOLPYA (original name of Plovdiv) electronic typewriter has a 3,000 symbol memory. It uses proportional script with 10, 12 or 15 symbols per inch.

#### Hungary

The EC 1011 computer system--derived from the MITRA 15 computer--comes equipped with a 1 MB capacity central memory and can operate with a 50 MB expansion disk memory.

The 52578 terminal made by Videoton was also demonstrated in Bordeaux. Its display has a capacity of 1,920 or 2,560 symbols.

Budavox exhibited data transmission systems, such as, e.g., COMPUTERTA, that can be connected to all JSEP systems as well as to the IBM 360 and IBM 370 computers. Maximum transmission speed is 9,600 Bd.

#### Poland

The EC 8371-01 telecommunication processor is equipped with a 16 to 128 KB memory and 64 lines. Maximum transmission speed is 19,200 Bd. The TELE JS system for remote data processing made by ELWRO uses three types of terminals, a 24x80 symbol capacity display and a dot matrix printer with printing speed of 50 lines per minute. Poland exhibited in Leipzig for the first time its IRM 6 and IRP 60 industrial robots for handling objects weighing 6 and 60 kg. It has five stages of motion zones, six stages if the robot is movable.

#### Romania

Among new products was the INDEPENDENT 102 microcomputer with 4x32 K word capacity, the FELIX M 118 graphic microcomputer (64 KB), the TELEPROM P 1 intelligent modular terminal based on the 8080A microprocessor with 56 K RAM and 8 K REPROM memory with 16 interruption inquiry lines and various peripheries. The TPCD 1 portable terminal serves for data acquisition entered directly into a computer or by means of modems and long-distance transmission lines (4 K RAM and 8 K PROM). Another exhibit was the DAF 2015 videoterminal with a 31 or 44 cm display. An exhibit from coproduction with the Control Data company was the new MD 10 coordinate plotter for format A3 with 0.2 mm resolution capacity, axial speed of 20 cm/sec and a 58 MB disk.

#### CSSR

From Czechoslovak production the SMEP program was represented at the Leipzig Fair by the SM 52/11 minicomputer with a 128 K word central memory and 1 K words of CACHE type memory, cycle 600 ns. The Digigraf 1208 (EC 7907) coordinate plotter's speed was increased to 70 cm/sec and precision to 0.01 mm.

#### USSR

The USSR exhibit was located in the pavilion itself. It exhibited the award-winning EC 1300 microcomputer and a mock-up of a large JSEP computer. Special attention was devoted to robotics, particularly in the area of mechanical robots.

## Yugoslavia

The Telecommunications Department of the M. Pupin Institute of Belgrade exhibited in a collective Yugoslav stand its original modems, the PP 2 and MPP 4800 models for synchronized and start-stop mode.

## China

After many years' absence China also participated in the Leipzig Fair. Its stand demonstrated several models of pocket calculators, and promotional literature about computer systems was also available.

## Other Countries

Three products had their world premiere at the Leipzig Fair: the FP 2520 copier of the AB Dick company and the FP 4520 copier of the same company; the third product was an ultraflat unit for the SD 300 floppy disk of the Epson company. The ITEK company exhibited its DIGITEK digital phot-typesetting machine, the BULL company its MICRO 10 and M 9060 magnetographic printer.

## Institute of Technological Cybernetics

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 3, 1984 pp 403-405

[Text] Our periodical established relations with the Institute of Technological Cybernetics of the Slovak Academy of Sciences (UTK SAV) from its very inception which remain unchanged to date. We have published interviews and information about it, including a recent article by its director, Doc Eng Ivan Plander, DrSc, about the Japanese project involving the fifth generation of computer systems (VYBER INFORMACI No 4/82). The SAV in its publication "Slovak Academy of Sciences 1953-1985" also described the activities of UTK SAV.

The basis of the institute was formed by the SAV Laboratory for Theoretical and Applied Mechanics, established in 1955 and renamed in 1961 the SAV Institute of Machinery and Automation. The setting up of an independent department of automation and computer technology gave rise in 1966 to the present UTK SAV.

The key mission of the institute is basic and applied research in the area of artificial intelligence, information-control systems in robotics and specialized problem-oriented computer systems. The institute is developing R&D activities in the scientific discipline of technological cybernetics, effectively and creatively contributes to dealing with scientific problems important to theory and practice. The institute develops its activities as a scientific production unit (VVJ). It is formed by a complex of R&D, developmental design, technological and production units which cover the entire science-research-development-experimental production-utilization cycle. The key mission of the institute is to develop the ability to introduce in short chronological cycles experimental production of the results of basic research and meet the needs of key users up to the commencement of mass production.

Basic organizational breakdown:

R&D sector:

- Technological Department,
- Artificial Intelligence and Theoretical Robotics Department,
- Control Systems Department,
- Computer Systems Department.

Experimental production sector:

- Technological Production Preparation Department,
- Production Control Department.

The institute has a branch in Banska Bystrica and a UTK SAV TO [Machine Tool Plants] Trenčin joint facility, the Galanta plant in Galanta.

A Base Laboratory for Artificial Intelligence was established at the institute on 1 January 1982.

Main attention in the area of technological cybernetics was devoted to research on theoretical and practical problems of comprehensive automation of technological processes, their mathematical description and their implementation by computer hardware and software.

The research area of comprehensive automation of technological processes dealt with basic problems of optimum control, adaptive and learning control systems and control of complex systems. The area of optimum control dealt with problems of static and dynamic optimum control, particularly of linear multiparameter optimal systems and optimum control with incomplete information. It devised algorithms of dynamic optimum control of complex systems. Research in the area of adaptive and learning control systems was oriented toward direct computer control in adaptive and learning systems through the use of findings made in the theory of dual control and controlled Markovian processes.

The theoretical findings arrived at through basic research were used in dealing with problems of optimum control of technological processes.

For the Slovnaft enterprise it dealt with conceptual problems of control of selected production processes. A mathematical description was devised for the process of gasoline reforming. The devised analytical model was implemented through comparison of measured values with computed results. Also devised was a regression model of the results of measurement of 10 various operating modes of the reforming station. Similarly, for the Duslo enterprise in Sala were solved several projects, primarily a proposed automated balancing system and a proposal for identification and control of urea production. Problems attendant to the control of production of polyamide cord silk were dealt with on behalf of the Chemlon enterprise in Humenne. It also dealt with conceptual problems of steel plant control as well as use of computers for control of technological processes in VSZ [East Slovak Ironworks] in Kosice and in East Slovak Cement and Lime Mills in Turen nad Bodvov. For the nuclear power plant

in Bohunice was worked out a concept for the application of a control computer for controlling the power generation operation of the reactor and of the entire power plant. For the Research Institute for Mechanization and Automation of Brick Production the institute devised a set of algorithms and adaptive control of firing of heavy clayware, and for the Slovak Industrial Glass Plants in Bratislava a set of programs and algorithms for adaptive control of glass production was devised.

Within the Interkosmos program the institute devised and completed development of a measuring and control system for the Biosputnik satellite.

In the initial years of the institute's activities the orientation of its computer technology research arose from specific needs for the computation of complex linear and nonlinear dynamic systems. For this purpose it solved problems of modeling of dynamic systems by means of passive electric analogies which led to the need for researching and building an electronic analog computer, soon supplemented by a block of nonlinear computation units.

The results of theoretical and subsequent research served as a basis for devising the RPP-16 all-purpose computer control system of the third generation produced by the Tesla enterprise in Orava. The RPP-16 is a single address digital computer intended primarily for direct control of processes in real time and in a closed system. Word length in memory is  $16 + 2$  bits. The ferritic working memory storage has a  $2\mu s$  cycle and is expandable in a range of 4 K to 64 K words. The computer's operating speed is approximately 250,000 operations per second. The RPP-16 can operate independently or in a hierarchical multicomputer arrangement with other RPP-16 computers, or with RPP-16 minicomputers, and even with other hierarchically higher JSEP computers. From the viewpoint of its input/output potential, interruption system, and set of instructions, it has the nature of a mid-sized computer. The RPP-16 system includes protection against feed voltage outages, protection of programs in memory against mutual interference and channels for direct access into the memory by means of a channel of block transmissions. In addition to routinely used peripheral systems it uses a special unit for interface with the controlled object. The RPP-16 control computer was provided with plentiful software adapted for control of processes in real time.

The UTK SAV developed an asynchronous transceiver (UART) designed for communication between computers and their SMEP peripheries with a complexity exceeding 1,000 transistors. It designed the Intel 8008 8-bit microprocessor of more than 4,000 transistor complexity in cooperation with the Kostrukta enterprise in Trenčin. It devised the pattern of masks for a 1,024 bit RAM semiconductor memory. It researched and developed the 16-bit SMEP SM 50/50 microcomputer.

In 197-1977 the institute was the work center of the head designer of SMEP in the CSSR. As part of these activities the institute developed extensive organizational efforts in the area of multilateral and bilateral cooperation among CEMA countries in the area of computer technology and automated control.

On the basis of a resolution of the SAV Presidium the UTK SAV was reorganized as of May 1978 into a VVJ oriented toward the area of artificial intelligence, information-control systems in robotics and specialized problem-oriented computer systems and their experimental production.



At the present time, the institute is the guarantor of the goal-oriented project of SPZV [state plan for basic research] in information-control systems in robotics, coordinates key tasks and deals with research problems in the area of information-control systems for industrial robots of higher generations, specialized computer systems, the relevant software and theoretical principles of artificial intelligence and of robotics.

As part of experimental production, it is oriented toward production of the 16-bit SM 50/50 microcomputer system, 1-bit SM 50/20 microcomputer for sequential control, the SM 51/13 emulative computer, the SM 54/30 videographic computer. In the implementation of results it cooperates with the Metallurgical Research Institute in Presov, the Electrotechnical Research Institute in Nova Dubnica, the general management of the Heavy Engineering Plants in Martin, the Welding Research Institute in Bratislava, the Computer Technology Research Institute in Zilina, the Computer Technology Plant in Banska Bystrica, the Bratislava Automobile Plants, and Tesla Piestany.

In the Seventh 5-Year Plan the institute is oriented toward dealing with research problems of goal-oriented project 606, "Information Systems in Robotics and Tasks Within Multilateral Cooperation of Socialist Countries in Research, Development and Production of SMEP Computers." It coordinates 3 key tasks and deals with 17 partial tasks which, when implemented, will contribute to the development of robotization, electronization and automation of production processes.

8204

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MICROELECTRONICS PRODUCTION INDUSTRY, INTEGRATION DISCUSSED

Production Increased 30 Percent

East Berlin BERLINER ZEITUNG in German 21 Nov 84 p 3

[Article by Dr Karl-Heinz Arnold, staff editor, BERLINER ZEITUNG, member, GDR People's Chamber: "Microelectronics: A Strategy Pays Off"]

[Text] Microelectronics with the integrated circuit (chip) as a basic structural element and the microprocessor as its core makes for an enormous increase both in the serviceability of many products and productivity in their manufacture. It provides extraordinary savings in material and energy. It forms the basis for complex automation in industry and through work rationalization in the other sectors of the economy. Development, production and the broadest application of microelectronics are therefore a major point in our economic strategy for the eighties conceived by the Tenth Party Meeting of the SED.

Increases of 30 Percent and More

In the year now ending, the GDR has achieved its best performance to date. For important microelectronic structural elements, production has increased by 30 percent and more, which means that the GDR has maintained its position among the few countries having a capable microelectronics industry. Following the three giants--the United States, Japan, and Russia--they include France, the Federal German Republic (including the U.S. affiliates located there), Great Britain, Italy, the CSSR, China, and India.

In the Erfurt microelectronics combine, microprocessors with 4-, 8- and 16-bit processing width are produced (1 bit = one yes/no statement, the smallest data unit). An 8-bit microprocessor system combines in four circuits about 50,000 transistor functions; in a 16-bit system there are more than 150,000.

An example will illustrate the difference from conventional electronics. One of the most modern structural components from the Erfurt parent company is the one-chip microcomputer U 881. It unites on one 37 mm<sup>2</sup> chip about 30,000 electronic functional units and weighs only 5.4 g. It is 80-times more powerful than the central unit of the old electron computer R 300, which contains 30,000 conventional structural elements (weight 306 kg). The production time for the U 881 amounts to less than one five-thousandth of the time required for the R 300.

The microelectronics combine, formed by resolutions of the Sixth Plenary Session of the Central Committee of the SED (of 1977), has been in existence since January 1978. Twenty-two hundred microprocessors were manufactured during this first year; by 1983 production had already risen to 135,000.

Combine: 23 VEBs, 65,000 Employed

At present, the combine includes 23 operational units with a total of 65,000 employed, including 6,100 apprentices. The largest units are the parent house in Erfurt (8,000 employed), the center for research and technology in Dresden, the semi-conductor plant in Frankfurt-Oder, the television electronics plant (WF Berlin, the GDR's sole producer of color tubes and optoelectronics, e.g., sensors for robotics, whose optic signals are translated into electronic control signals) and the watchmaking plant Ruhla. The capacity of many plants, among them the WF and the VEB microelectronics Stahnsdorf, was expanded in 1983 and 1984.

Two additional manufacturers of electronic structural components are the combines Ceramic Works Hermsdorf and Electronic Structural Elements Teltow. The Hermsdorf combine is a major producer of hybrid circuits. This technology proves to be quite robust, is efficient enough for many types of application and cost-effective even for relatively low quantities. The importance of hybrid technology is on the increase internationally. The Teltow combine produces passive structural elements (for example, printed circuit boards, plug connectors, condensers and resistances), indispensable components of microelectronics.

A First Result: These few facts already illustrate that the strategic decision made by the party and government leadership in the seventies concerning the formation of our own microelectronics foundation had been the right one--even a vital one.

Within a few years a microelectronics industry was created in the GDR, which has developed very dynamically and promises important new performances. Creation of this industry was an indispensable component in safeguarding the export capacity of an increasing number of products and the necessary enrichment of our consumer goods supply. Without our microelectronics, the present supply of over 35,000 industrial robots would be inconceivable, the number of such robots having quadrupled since 1980.

A necessary component in the creation of this young and promising industry, to which by now more than 100,000 workers belong, was a number of factors which are also of considerable importance:

Qualification of tens of thousands of workers; extensive investments worked out by our overall economy; constantly increasing efforts of suppliers, from chemistry over the glass- and ceramics industry to metallurgy, of which products with extreme purity and refinement are expected; and last but not least, the cooperation with basic and applied research in the Academy of Sciences as well as in universities and technical institutes.

## A Broader Assortment Through RGW

A Second Result: The efforts toward the creation and expansion of our microelectronics were and still are connected with cooperation in the RGW, especially with the Soviet Union. The first governmental agreement between the GDR and the USSR dates back to 1977. It included the work-division development and the production of circuits and structural elements, together with special technological equipment. The CSSR became an additional major partner.

By value, the structural elements used by us largely represent domestic production, but far more than one-half of the types come from other socialist countries. The spread of the assortment thus available probably represents the most important advantage of cooperation in the Council for Mutual Economic Assistance. Microelectronics will not be an individual undertaking for the GDR in the future either.

A Third Result: With the assortment of structural components available in the GDR, it is clearly possible to reach international peak performances, both for use in the instrument industry, in the construction of facilities, in the consumer goods industries and in the technological use in all sectors of the economy for automation and rationalization.

On the whole, the advantages to user sectors in the national economy is already much higher than the by no means small expenditures among the manufacturers of structural components. The use of microelectronics in a product or in its technological utilization must lead to excellent results in operation, quality and productivity which can withstand international comparison. However, wherever companies take a wait-and-see attitude to microelectronics, the possibilities of the most advanced technology are given away. This applies to both economic advantages and the social results, which can only be achieved by increased effectiveness and quality of work.

Our present task lies then in producing more microelectronics at reduced cost, and first of all, in using microelectronics increasingly so that it will contribute even more to the national economy growth.

### Integration Efforts Termed Inadequate

East Berlin BERLINER ZEITUNG in German 22 Nov 84 p 3

[Article by Dr Karl-Heinz Arnold, staff editor, BERLINER ZEITUNG, member, GDR People's Chamber: "Microelectronics: Making Broader Use of What is at Hand"]

[Text] Structural elements of microelectronics are produced to a considerable extent in the GDR, and the assortment is complemented by imports from other socialist countries, especially from the Soviet Union. Sufficient microprocessors are available for a broad application in products and for technologies, as already reported by us in yesterday's contribution "Microelectronics: A Strategy Pays Off".

As far as practical uses are concerned, which alone bring about any profit, two basic facts evolve.

Fact No 1: Microelectronics has already made a great entry in industry, already provides remarkable effects and expands almost daily through new examples of application.

Already, quality and efficiency of two-thirds of the entire production in the industrial sector of electrotechnology/electronics are determined by the use of microelectronics. In tool and processing machine construction, the component of products in which microcomputers, microprocessors and semi-conductor stores are used has increased 20 percent this year compared to 1983. Leaders here are the combines Textima, Polygraph "Werner Lamberz" and the WMW combine "Fritz Heckert".

In Berlin, all organizations directly or indirectly involved in the development and production of microelectronics also belong to the pacesetters in application, both in products and in the rationalization of their own production. We should here mention: WF, EAW Treptow, Automation Facility Construction (EAB), measuring electronics, and radio technology.

The new products of Star Radio are every bit as much applied microelectronics as is the new radio from the EAW. Modern control systems for grinding automats evolved from a cooperation between BWF Marzahn and EAW, which can meet the requirements of the world market. Additional tool machines and industrial robots from Berlin are fitted with freely programmable controls. The VEB mens' clothing "Fortschritt" ("Progress") works with automated computer-assisted cutting.

#### Units Design Their Own Circuits

The greatest progress is achieved by those combines and organizations which make their own contribution to the development of microelectronic structural components, for example monolithic and hybrid circuits for requirements of their own production.

This means that the logical requirements of a required circuit are described, type and mode of production are discussed with the manufacturer (Microelectronics Erfurt or--for hybrid circuits--Ceramic Works Hermsdorf), the necessary technical documents are worked out, and many users are also able to produce samples of hybrid circuits.

The Textima combine, which has maintained since 1981 its own center for the development and construction of branch-typical electronics, is here exemplary, also the Institute for Communications Technology in Berlin, whose work for highly integrated circuits commands respect. Structural components have also been developed very successfully in the center for research and technology of the EAW combine, which has also built prototypes for hybrid circuits. The Berlin FDJ is especially responsible for the regional youth project microelectronics.

Wherever a robot with microelectronic control is used around the clock, where measuring and testing processes are automated with the help of the "siamese twins" opto- and microelectronics, where tiny circuits and computers take over physical work, increase the serviceability of products and decrease costs--that is where we profit from the newest technology for economic and social progress. However, this is exactly what is as yet not done to the proper degree.

Fact No 2, therefore: The use of microelectronics is far from taking advantage of all possibilities.

This does not mean possibilities established by high investments. It rather means the many thousands of uses (applications) for the seemingly minor case.

An example: The pressure resistance of tablets is to be measured in the VEB Berlin-Chemie. It used to be that every measured value was written down in order to establish an average. Today, one microcomputer gathers the measured values and reports the average value. We were dealing here with "only" one worker freed of monotonous and time-consuming tasks. Are we saying that we do not need such effects?

One argument prevails: We do not have the necessary experience and qualified staff to prepare for the use of microelectronics! You can hear this in Berlin mainly in the locally administered industry, which has to do most of the catching up in the use of this technology, at times even in a centrally-run VEB.

This Argument No Longer Works

This argument is completely unfounded. There are lots of ways to support the use of microelectronics equally and especially in small operations. This holds in particular for the consulting and information agencies' microelectronics which exist in all regions.

In Berlin, such an agency has existed since 1980 in the VEB application center, a part of the microelectronics combine. However, inquiries by Berlin plants are still insufficient. Especially the many operations without their own electronics department should seek the partnership with consulting and data agencies for a planned solution of their rationalization problems. It was with their help that, as an example, the application example described in the VEB Berlin-Chemie came about.

The party organizations in the companies have a special responsibility for promoting the necessary positive reaction to this technology and to eliminate ideological "obstacle thresholds". It is the task of our government heads to make experts available who have devoted themselves to microelectronics and can guide others on this path. This also includes a systematic qualification, as it is offered, for example, by the application centers and the KDT.

The coming year will be marked by a further increase in the supply of microelectronics and its use. This equally applies to consumer goods, even though much remains to be done here. Introduction of a pocket learning computer for schools has already started. The supply in capable home electronics, electronic watches, and computer-controlled housekeeping electronics is expanding; a respectable production of home computers from two combines (Robotron and Mikroelektronik) can be expected. Computer and picture screen technology is on the march--at the workplace of the builder and in savings banks, in hospitals (Charité is already connected to a data bank) and in apartment exchange.

- One thing, however, is important for every operation: One must and want to take the first steps toward using microelectronics oneself--their use does not drop from the skies. One must know where one can use it and concretely deal with the possibilities. Talking about it and "concepts of use" without practical value do not lead to anything.

Nobody needs to shy away from microelectronics. Programming is no secret --one can learn it and then can talk to the computer. And it remains part of our social security, the assured right to work. Yes, shying away should really be ruled out when we look at the possible advantages of microelectronics and robotics technology.

9243

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R-34 COMPUTER HARDWARE, SOFTWARE DESCRIBED

Warsaw WIDADOMOSCI TELEKOMUNIKACYJNE in Polish No 7, Jul 84 pp 20-21

/Article by Engineer Wacław Piwowski: "Polish Computer Equipment"/

/Text/ Within the next few years and in the future to 1990, it is expected that the directions of production of Polish computer equipment will be as follows:

--the production of Odra 1300 series computers will cease to expand, except that:

--a limited quantity of central processing units will be produced as replacements in currently operating systems,

--the peripheral equipment for the Odra 1300 will aid the domestic market in supplementing existing configurations,

--the system will permit the use of 30-MB discs;

--deliveries of R-32 systems will be kept at the 1982 level, with no price change;

--production of teleprocessing equipment will be increased primarily for export;

--production of Elwro 500 series microcomputers for office use will be initiated.

Thus, in the next few years Odra 1300 users can replace or expand their systems, and new customers interested in mid-sized computers can expect to use the RIAD series computers.

Production of computers to 1990 will focus primarily on the RIAD series of computers.

Let us look more closely at Elwro's proposals for the next few years. Initiating production of the R-34 computer is the primary change. The R-34 is the first computer of the RIAD 3 series (designated EC1034), which is replacing the currently produced EC1032 computer. This computer will include a 1 to 4 MB semiconductor main memory (with possible expansion to 16 MB), a control semiconductor memory and an increased number of input/output channels (eight).

The new computer will be 50 percent faster; its power consumption will be reduced fivefold; and its mean time between failures will improve tenfold. This computer will be available for purchase on the Polish market after 1986.

It is expected that many peripheral devices will be available for operation with the R-32; for the R-34, such peripheral devices will be available after 1986.

The following memories will be available this year:

--the Bulgarian-produced 100-MB EC5067.2 disk memory, which has two 100-MB disk memories in a single case; the maximum number of disk drives in the system is 32 x 100 MB;

--a 200-MB disk memory with a EC5667 01 control module and a EC 5567 control unit (four disk drives, 200 MB each);

--the possibility of connecting PT-5 tape memories, having record densities of 800/1000 bits per inch, to R-32 systems.

Among printers, starting in 1984, initiating production of EC 7033 M (DW-401) equipment is projected using a drum-type mechanism and microprocessor control system that is different than those now produced.

The connection of the EC-5075 input/output equipment (produced in Czechoslovakia), which will be available on the Polish market about 1985, to the R-32 and R-34 computers is being considered.

It is projected that new CRT monitors having a capacity of 3,000 characters, and local color monitors (semigraphic type SM-7215 produced by Elzab), will appear during the 1985-1986 period.

Modernization of the teleprocessing subsystem is also projected.

Modernization of the EC-8371.01 processor will be based primarily on the following modules:

--a type-2 channel adapter, which will assure operation with RIAD computers via a selector channel (beginning in 1984);

--a type-3 communications scanner, which will greatly increase the capacity of the PDP (1986);

--a 256-kB semiconductor memory (1985);

--a disk adapter (1985);

--new linear packets permitting operation with 48000 b/s modems (1985);

--a pulse power supply (1984).



Among the terminals, it is projected that the PSPD-90 and A5 120 terminals will probably be linked to the teleprocessing system, and that the EC 8575M terminal will be modernized by equipping it with floppy disk memories.

During the 1983-1985 period work will be conducted to assure supplies of terminal systems after 1986.

These terminal systems will be used to gather industrial data and to automate banking operations, permitting on-line operation with a primary Uniform System computer.

#### Elwro 500 Series Microcomputers

Production of the 500 series microcomputer is based on the use of large-scale integrated circuits and microprocessors. They will be used in statistics, bookkeeping operations, materials management, planning and the like.

It also is expected that this equipment will be used as terminals in the teleprocessing system.

#### EC1032 and EC1034 Computer Software

The OSJS-P5.0 revision 1 will be the primary operating system for the EC1032 computer.

The OS/JS6.1 (\$VS) operating system is expected to be developed for the EC1034 during the 1983-1985 period, that is, a system controlling a single virtual memory having the OS/JS6.1 MVT and VM/JSP systems user functions, a multiaccess system controlled by virtual machines. This system assures EC1032 and EC1034 software transportability.

A final operating system for the EC1034 will be selected around 1985 after the OS/JS6.1 or 7, OS/VS1 7, OS/VS2 1.7 or 3.0 are evaluated.

#### Software Tools

It is projected that the SKOT terminal service system and the HADES management system with hierarchally based data will be developed.

It also is projected that an Odra 1300 computer emulation subsystem will be developed on the RIAD computers.

It is expected that the first pilot installation of the SK JS/2 computer network will be initiated during the 1986-1987 period; this network will permit common use of various computer system resources.

Network methods to access a software node using the X.25 protocol, a buffer processor (on the EC8371.01 processor) and the TELEDATA system will be developed.

11899

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